NETWORK WORLD

The Newsweekly of User Networking Strategies

Volume 7, Number 4 | An IDG Communications Publication | February 5, 1990

ANI users face software challenge

By Tom Smith
New Products Editor

Early users and software experts say companies face a significant amount of programming work to exploit the capabilities of ISDN's automatic number identification (ANI) feature.

Even the base level of ANI functionality requires that users retool data base management systems to accept incoming telephone numbers as queries that initiate the transfer of customer data to an agent's workstation.

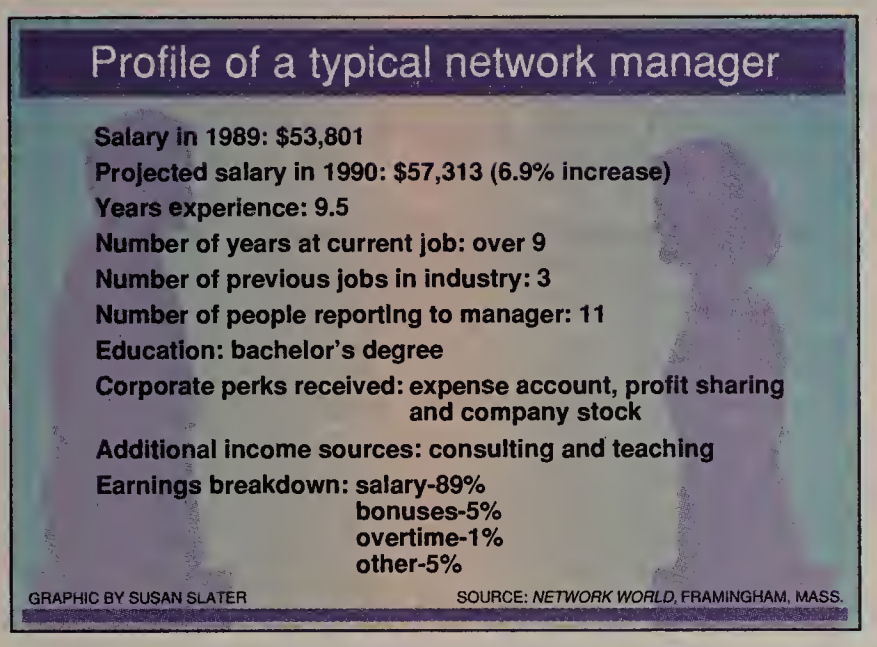
Congress mulls ANI blocking legislation, page 2.

But fully capitalizing on ANI will require costly and time-consuming software development. For example, some users are looking to build sophisticated ANI applications for pulling together a variety of information that can be used to market new products or services to a particular customer. The application would decide which information to glean based on data in the customer profile.

Such applications promise to provide a competitive advantage but would be difficult to develop, users and analysts said.

The first step in developing ANI applications is reprogram-

(continued on page 111)



Net managers stay one step ahead of inflation

Survey shows pay varies widely by region, industry.

By Salvatore Salamone
Features Writer

Never mind keeping up with the Joneses — keeping ahead of inflation is what's really important. Based on *Network World's* fifth annual salary survey, network professionals are doing just that.

The salary survey, conducted by IDG Communications Research Services, reveals that the average *Network World* reader's total compensation in 1989 was $53,801. That's up almost 6% from last year's average of $50,853, which means network professionals kept ahead of last year's inflation rate of 4.6%.

As shown in the graphic above, the typical salary survey respondent has 9.5 years of professional networking experience and works for a company whose 1988 revenue was $3.5 billion. On average, respondents have 11 people reporting to them.

Forty-one percent of the respondents hold a bachelor's degree, 25% have a master's degree, and 5% hold doctoral degrees. Thirty-six percent are responsible for both voice and

(continued on page 99)

Northern Tel lays new PBX foundation

Modular, digital Meridian 1 replaces SL-1 and SL-100 families, serves from 30 to 60,000 lines.

By Bob Wallace
Senior Editor

NEW YORK — As expected, Northern Telecom, Inc. last week introduced the Meridian 1, a modular, digital private branch exchange that supports 30 to 60,000 lines and supersedes the company's existing SL-1 and SL-100 PBX families.

The Meridian 1 can handle eight times as many lines as the SL-1. It is also 50% smaller than the SL-1 and SL-100, and is compatible with both switches, providing a smooth migration path for users.

"With Meridian 1, Northern Telecom has continued its commitment to enhancing and evolving its PBX product line without obsoleting our current investments," said Ted Speakman, telecommunications manager for the Fred Hutchinson Cancer Research Center in Seattle, an SL-1 user. "That's why the Meridian 1 is such a dynamite product."

Speakman is president of the 3,000-company International SL-1 Users Association (ISLUA).

The Meridian 1 uses denser line cards than the SL-1 and also employs software-programmable universal trunk cards.

The basic Meridian 1 building block is a single-shelf module, measuring 32 by 26 by 21 inches, that houses up to 16 $3,100-line cards. Each line card supports 16

(continued on page 107)

SL-1, SL-100 user chiefs Ted Speakman and James Candito lend support to new Meridian 1.

NETLINE

TIMEPLEX OFFERS a new T-3 mux and a family of internetworking products. Page 2.

COS GETS APPLAUSE from user members, who praise the group's leadership role in uniting global standards organizations. Page 2.

AT&T PITCHES A DUAL discount plan for users of its SDN and 800 services. Page 4.

IBM, MOTOROLA TEAM UP in a radio data network service venture. Page 4.

MICROSOFT EXECUTIVE discloses that the latest version of LAN Manager will be late. Page 4.

THE FIRST MERIDIAN 1 user speaks out on plans for the new Northern Telecom private branch exchange. Page 14.

NEWSPAPER

Distributed application tool pays off for Putnam

By Jim Brown
Senior Editor

BOSTON — The Putnam Companies, Inc. last week said it has built an object-oriented development tool that will enable its programmers to construct distributed network applications with ease.

Putnam's Financial Workbench is based in part on the Network Computing System (NCS), a distributed computing technology developed by Hewlett-Packard Co.'s Apollo Systems Division.

The tool enables programmers to write applications that spread processing chores among multiple computers on a local-area network.

The Financial Workbench is expected to give the company a competitive boost by cutting development time for powerful financial analysis applications.

"We're trying to build software systems that help in the investment decision process," said Steven Levy, a Putnam vice-president and quantitative analyst.

The company has already used Financial Workbench to develop an application that enables Putnam's financial analysts and portfolio managers to access a wealth of information from data bases on different network-attached devices.

The application helps Putnam portfolio managers track the per-

(continued on page 106)

Users rethink corporate net facilities mix

By Wayne Eckerson
Senior Writer

Lured by low prices and improved performance, many companies are shifting a greater percentage of their private-line traffic to switched services.

Although it is difficult to quantify, the fundamental mix of dedicated and switched services that corporations use to meet their networking needs seems to be changing. That trend is bound to accelerate with the introduction of new switched network technologies.

In the voice arena, large companies are already scaling back their private networks in favor of virtual voice networks or discounted switched services provided under special contractual arrangements.

An out-and-out migration to switched services may be sparked by the acceptance of Integrated

(continued on page 109)

Timeplex unveils T-3 mux, internetworking offerings

Networked TX3/SuperHub supports 10 T-3 lines; firm offers FDDI net tools, other LAN links.

By Paul Desmond
Senior Writer

NEW YORK — Timeplex, Inc. last week extended its wide-area and internetworking offerings with a new networked T-3 multiplexer and local-area network bridges and routers, including models that support FDDI.

The products lay the groundwork for Timeplex's network strategy of the 1990s, which calls for supporting a range of high-speed wide-area network links, including those based on the emerging Synchronous Optical Network (SONET) standards.

New Time/LAN 100 products for 100M bit/sec Fiber Distributed Data Interface (FDDI) networks position the company to support emerging high-bandwidth applications that will fuel the need for high-speed links (see "Timeplex unwraps internetwork tools for FDDI, other local nets," page 10).

Timeplex's new T-3 multiplexer, dubbed the TX3/SuperHub, is compatible with any vendor's T-1 multiplexer and supports as many as 10 T-3 circuits or a mix of T-3 and T-1 circuits, up to the

(continued on page 9)

Proposed bill would give users option to block ANI

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — Sen. Herb Kohl (D-Wis.) last week introduced a bill that would guarantee customers the right to block transmission of their telephone numbers if their carrier offers automatic number identification (ANI) services.

The law would apply to real-time number identification for 800, 900 and direct-dial long-distance services, as well as local calls, where most of the controversy has centered to date. But it may also prevent carriers from giving corporations a monthly record of all phone numbers dialing into 800 and 900 numbers, a service that is currently available.

Some corporate users said they expect strong opposition to the bill, which could cripple their efforts to provide new services based on ANI. Others downplayed the significance of the legislation, saying many customers realize the benefits that could result from ANI and only a limited number would seek blocking.

The California legislature has already passed a law mandating that customers have the option of blocking their number if ANI services are offered.

ANI services, which allow a

(continued on page 111)

Users give COS high marks for global standards efforts

Praise plan to work with ITRC-MAP/TOP group.

By Bob Brown
Senior Editor

MCLEAN, Va. — User members of the Corporation for Open Systems International (COS) acknowledge that the group's efforts haven't yet resulted in a major rollout of OSI products, but they insist that COS has helped pave the way for the open networks of the '90s.

Users said that by joining forces with domestic and international standards groups, COS has fostered a global effort for accelerating development of products based on the Open Systems Interconnection and Integrated Services Digital Network standards.

They applauded COS' recently announced plan to merge its membership with that of the Information Technology Requirements Council (ITRC), the parent organization of the MAP/TOP Users Group. The move is expected to give users a more unified voice in defining their OSI needs to vendors.

"What we've needed is to find real leadership and direction for the overall standards process," said O. Ray Pardo, recently-named COS vice-chairman and chief telecommunications engineer at Bechtel Corp. "COS has positioned itself to play this role."

Bud Huber, a COS member and manager of advanced networks integration at Hughes Aircraft Co. in Long Beach, Calif., agreed.

"COS has had a lot of success in making agreements to harmo-

(continued on page 107)

Briefs

Wedding's off. Telecom*USA, Inc., the nation's fourth largest long-haul carrier, last week said it has broken off acquisition talks with ALC Communications, parent company of long-distance carrier Allnet Communications Services, Inc. Telecom*USA said negotiations were halted after it finished a further financial review of ALC, which it was to acquire for $140 million. When it originally announced its intentions last month to acquire ALC, Telecom*USA acknowledged it would assume about $125 million of ALC's debt. Telecom*USA declined to say why it ended the talks.

Pillsbury makes X.400 connection. Pillsbury Co. last week said it has linked its internal electronic mail network to Western Union Corp.'s EasyLink E-mail service via an X.400 gateway. The EasyLink service and X.400 gateway replace a proprietary message switch that Pillsbury used to communicate with its brokers and trading partners nationwide. According to Pillsbury officials, the X.400 gateway is less expensive to maintain than a proprietary system and makes it easier for Pillsbury's brokers to communicate with the company. Pillsbury will use the X.400 gateway to transmit price changes, shipping information, product announcements and promotional data to about 75 brokers.

Comnet heads west. The IDG Conference Management Group, which is holding the Communication Networks conference and exposition in Washington D.C. this week, announced the formation of a sister conference — Communication Networks West '91 — to be held July 15 to 18 at the Moscone Center in San Francisco.

Islands in the fiber stream. AT&T last week cut over a $178 million undersea fiber-optic cable linking Guam, the Philippines and Taiwan, providing the first fiber-optic access to those countries from the U.S. The cable, dubbed GPT-1, is connected in Guam to the Hawaii-4/Trans-Pacific Cable-3 (Haw-4/TPC-3) undersea fiber cable, which runs between the U.S. and Japan. Later this year, AT&T plans to cut over another undersea fiber cable linking Haw-4/TPC-3 to Hong Kong and South Korea. An undersea fiber cable is also planned that will run from the U.S. mainland to Puerto Rico, Jamaica, the Dominican Republic and Columbia.

Computers to see the light. AT&T Bell Laboratories last week said it has built a digital optical processor that uses light to process data. Developed over the last five years, the digital optical processor paves the way for the development of a computer that uses photons instead of electrons to represent data. Bell Laboratories researchers said the digital optical processor can process up to 1,000 times as much data as a comparable electrical processor and could be used to build more powerful central office switches capable of switching data between fiber-optic lines.

CONTENTS

***Network World* wants you.** If you have a news tip, please contact us. We'd also like to hear about unusual network applications and how you're optimizing your networks for performance or savings. Contact Editor John Gallant at (800) 622-1108, ext. 426, or through MCI Mail at 390-4868.

Network World
161 Worcester Road
Framingham, Mass. 01701
(508) 875-6400

Second-class postage paid at Framingham, Mass., and additional mailing offices. *Network World* (USPS 735-730) is published weekly, except for a single combined issue for the last week in December and the first week in January by Network World Publishing/Inc., 161 Worcester Road, Framingham, Mass. 01701.

To apply for a free subscription, complete and sign the qualification card in this issue or write *Network World* at the address below. No subscriptions accepted without complete identification of subscriber's name, job function, company or organization. Based on information supplied, the publisher reserves the right to reject non-qualified requests. Subscriptions: 1-508-820-7444.

Non-qualified subscribers: $3.00 a copy; U.S. — $95 a year; Canada, Central & South America — $110 a year; Europe — $165 a year, all other countries — $245 a year (airmail service). Four weeks notice is required for change of address. Allow six weeks for new subscription service to begin. Please include mailing label appearing on front cover of the publication.

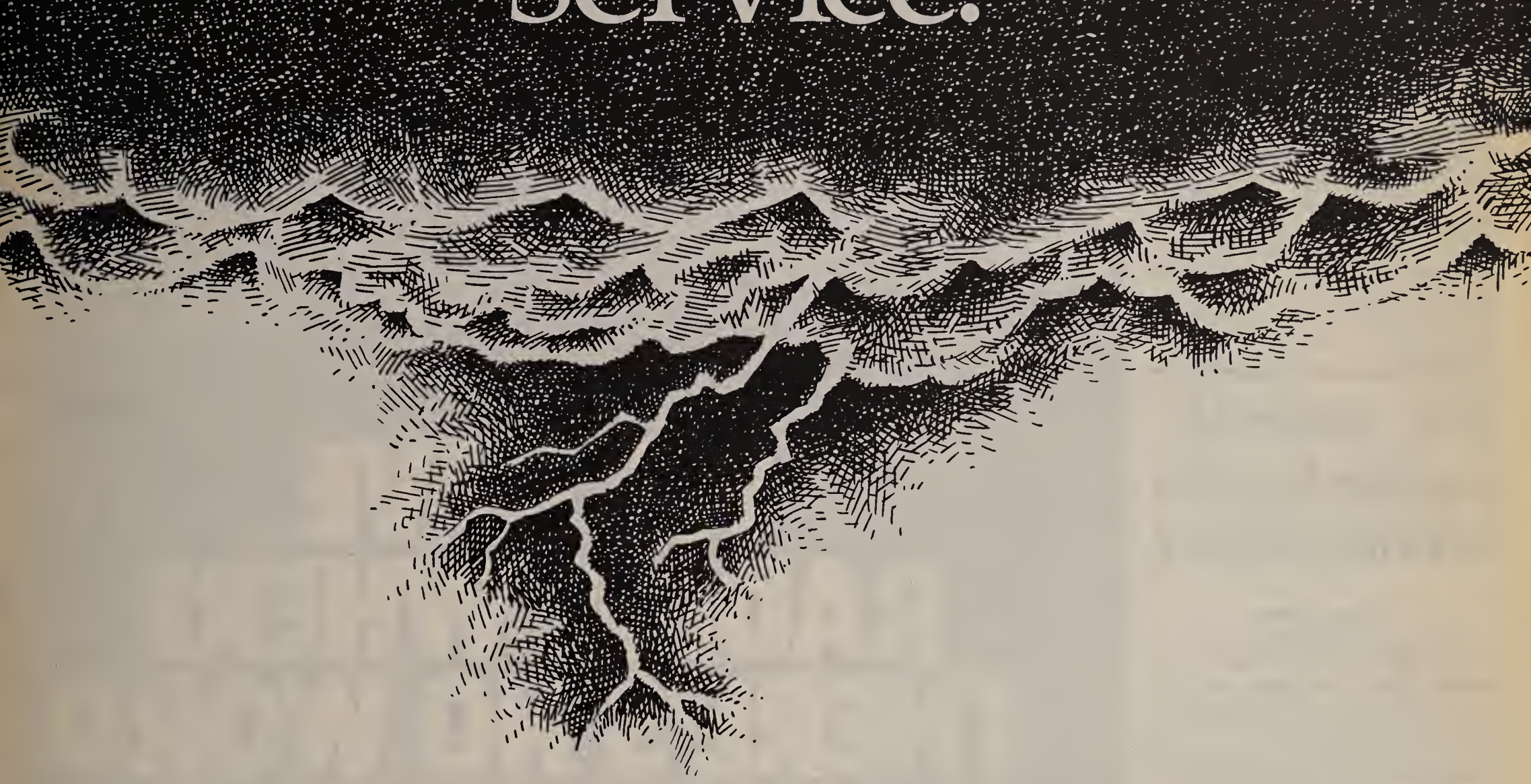
Network World can be purchased on 35mm microfilm through University Microfilm Int., Periodical Entry Dept., 300 Zebb Road, Ann Arbor, Mich. 48106.

Network World is distributed free of charge in the U.S. and Canada only to qualified management or professionals who specify and maintain communications equipment and systems, including voice, data and video, as well as to common carriers, consultants, systems houses and manufacturers of communications equipment.

POSTMASTER: Send Change of Address to *Network World*, 161 Worcester Road, Framingham, Mass. 01701.

See us at CN '90. Booths 556 and 656.

Acts of God are just one reason we're so religious about service.



At N.E.T. we're fanatics about service because your network resources are critical to you. That's why we have a plan for every contingency, for every need—whether it's as catastrophic as lightning strikes or as common as network monitoring. The result is a proven edge in uptime.

When acts of God occur, we're ready.

Take, for example, the fire that struck the Hinsdale station of Illinois Bell. Thousands of their customers were down for weeks. We had our client up and running.

Or consider the flood that damaged another client's node. We delivered and installed a replacement node before business hours resumed.

We support you with the most comprehensive service structure in the communications network industry.

From designing a network that meets your specific requirements to keeping your network up and running at maximum performance, you can count on the N.E.T.™ support team.

The Technical Assistance Center (TAC) provides 24-hour-a-day, seven-day-a-week hotline service and remote diagnostics for clients.

Our Expert Fault Management Service (EFMS) is a complete fault handling system that monitors your network and automatically relays faults to TAC. Our staff uses a world-class database to diagnose problems and recommend resolutions. This service can save you many hours and thousands of dollars.

The Expert T-span Service designates N.E.T. as your agent to resolve carrier issues for you—fast.

Our Systems Integration Group (SIG) gives you complete single-vendor support and coordination for multi-vendor networks.

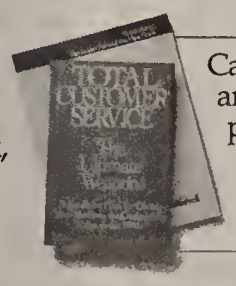
Field Service Engineers are mandated to provide solutions on receipt of first call. These senior-level technicians are located within easy reach of 60 cities in the U.S. and abroad.

And to help you run your network, we provide in-depth, hands-on training at our N.E.T. training centers.

Like to know more?

Get your copy of *Total Customer Service: The Ultimate Weapon*, and read the N.E.T. service story.

The book by William Davidow and Bro Uttal uses N.E.T. as one case study to show how a company put together the tools and the team to provide the industry's "outstanding service factory."



Call for your free book* and N.E.T. information package.
Information Hotline:
1-800-952-6300
Ask for Dept. N11

NETWORK EQUIPMENT TECHNOLOGIES™

A step ahead.℠

AT&T asks FCC to OK unified discount plan

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — AT&T last week asked the FCC for permission to offer a unified volume discount plan for its Software-Defined Network (SDN) and 800 services that would let users combine traffic to qualify for larger savings.

In a filing with the Federal Communications Commission, AT&T said the expanded discount plan is a competitive necessity. The carrier estimates that it has lost 5% of the outbound switched services market annually since 1984 and 6.3% of the 800 market each year since 1986.

The main reason for the market share losses, AT&T claims, is that rival carriers are undercutting its prices through off-tariff deals and volume discount plans that combine traffic from disparate services.

This is the first time AT&T has proposed offering a unified discount plan on dissimilar services for all customers. AT&T's Tariff 12, which allows the carrier to offer discounts on a package of different services, is available only to selected customers in tailored network deals.

AT&T also offers discount plans for different services provided under a single tariff. For example, its Multi Service Volume Pricing Plan allows customers to combine traffic from different digital private-line services, ranging from 9.6K bit/sec to T-1 speeds.

Under the plan filed with the FCC, AT&T would enable customers to include traffic from interstate and intrastate Megacom 800, 800 Readyline and standard 800 service under an expanded volume discount plan for SDN. Customers must commit to five million minutes of combined usage annually and sign up for service for one- to three-year terms. If their traffic falls short of five million minutes, customers must pay a penalty of 3 cents per minute on the difference.

AT&T is proposing two discounts for

(continued on page 105)

Software bugs likely to delay LAN Manager V. 2.0 availability till fall

Beta-test OEMs cite host of problems with software version.

By Laura DiDio
Senior Editor

REDMOND, Wash. — A Microsoft Corp. executive last week disclosed that delivery of LAN Manager Version 2.0 to OEMs will be delayed until the end of the first quarter so that the company can rid the code of design glitches.

While some problems are typical for a product in this stage of development, several OEMs that have beta-test copies of Version 2.0 said the bugs in the code are numerous and should have been solved by Microsoft in earlier testing. Because of these problems, the OEMs contend that Version 2.0 will probably not ship to end users until the fall, instead of this spring.

Mike Murray, general manager of Microsoft's Network Business Unit, said there is nothing seriously wrong with Version 2.0. He also said the company is stressing

(continued on page 110)

IBM, Motorola partner in radio network venture

By Paul Desmond
Senior Writer

NEW YORK — IBM and Motorola, Inc. announced here last week they have formed a joint venture, ARDIS Co., to provide a radio data network service that will enable users with specially outfitted data terminal equipment to access remote hosts via wireless radio links.

ARDIS, which stands for advanced radio data information service, will provide the service using Motorola's existing commercial radio net and a radio network IBM has been using internally for six years to support its 18,000 field service technicians. The service will be available in 8,000 cities and towns across the country.

Initially, only Motorola's KDT 840 hand-held wireless terminal will be used to access ARDIS. The KDT 840 has an integrated radio frequency (RF) modem and supports a variety of protocols, including IBM's 3270 data stream.

Motorola is working with third-party vendors to incorporate its RF modem into personal computers, which will give those devices wireless links to remote ARDIS users or data bases.

ARDIS is targeted at companies that need to support employees on the road, such as field service personnel, sales people and insurance representatives.

A number of companies are already lined up to test ARDIS, including New York Life Insurance Co., Sears, Roebuck and Co. and Whirlpool Corp.

(continued on page 6)

Racal-Milgo touts new RISC-based bridge/router as most powerful

By Tom Smith
New Products Editor

BOSTON — Racal-Milgo last week unveiled what it said is the first Reduced Instruction Set Computer (RISC)-based bridge/router, saying it provides 30 times the processing power of competitors' products.

LanNet Express enables users to perform LAN-to-LAN bridging and route local-area network data over a high-speed, high-performance bus to T-1 wide-area network (WAN) links. Eventually, the product will support routing among dissimilar LANs.

Racal-Milgo, which unveiled the product at a press conference here, said LanNet Express was in development at the Network Communications Group of Digital Communications Associates, Inc. when it acquired that unit in November ("DCA sells off WAN unit to Racal-Milgo," *NW,* Nov. 27, 1989).

The bridge/router is based on a single Advanced Micro Devices, Inc. (AMD) 29000 Reduced Instruction Set Computer microprocessor that sits on a controller board straddling the unit's bus. LanNet Express also comes equipped with a 1.4M-byte floppy disk drive, which is used to load a variety of network protocols onto interface cards.

The bridge/router has three slots on both sides of its 32-bit mid-plane bus, which acts as an interface between LAN adapter boards on one side of the bus and wide-area interface cards on the other side.

Initially, Racal-Milgo will only supply an Ethernet interface on LanNet Express, limiting it to Ethernet bridging and routing of Ethernet data over wide-area links.

The company plans to offer interfaces to support 4M and 16M bit/sec IBM Token-Ring Networks, Internet Protocol routing, Simple Network Management Protocol and attachment to Fiber Distributed Data Interface networks.

The Ethernet interface comes with two ports, each supporting a single Ethernet LAN or node. The wide-area interface has four ports, each of which can support a T-1 line, or the European T-1 rate of 2.048M bit/sec.

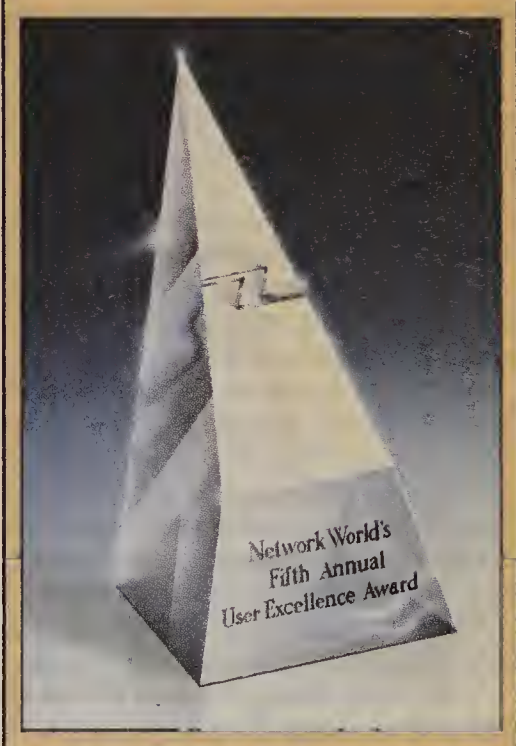
LanNet Express supports up to six local bridging sessions or four LAN-to-WAN connections simultaneously.

LanNet Express supports a range of LAN and transport protocols, including the Transmission Control Protocol/IP, Digital Equipment Corp.'s DECnet and Local Area Transport protocols, and Xerox Corp.'s Xerox Network Systems protocol.

Network protocols from a Network Interface Module are loaded onto the disk drive and downloaded to the wide-area interface cards.

The company said LanNet Express can provide exceptionally fast processing because it uses the controller's AMD 29000 RISC chip in tandem with a Motorola Corp.

(continued on page 105)



Network World awards to be given at Comnet

The winners of *Network World's* Fifth Annual User Excellence Awards will be on hand to accept their awards during the opening ceremonies of the Communication Networks conference in Washington, D.C. this week.

The awards presentation will take place in the Renaissance Ballroom in the Ramada Renaissance Hotel at TechWorld beginning at 6:00 p.m. today.

Network World's User Excellence Awards are presented each year to users who implement creative networking strategies to gain a competitive advantage or to improve operations.

The two companies to be honored as cowinners are CSX Technology, Inc. of Jacksonville, Fla., and Sears Technology Services, Inc. of Schaumburg, Ill. The eight companies receiving honorable mention are Bendix/King, Federal Express Corp., Hughes Aircraft Co., Martin Marietta Electronic Systems, Prince William County, Va., SunTrust Service Corp., Union Pacific Railroad and WNEV-TV, Boston.

See the FAXNeT Form on Page #108

Groups unite to develop common APIs for X.400, X.500 standards

Common interfaces will let users mix and match products.

By Walter Sweet
West Coast Correspondent

NASHUA, N.H. — Two standards groups last week joined forces here to develop a set of application program interfaces (API) that should speed the advent of a global electronic mail infrastructure.

The X.400 Application Program Interface Association (APIA) and X/Open Co., Ltd. said they will jointly develop APIs for X.400, the Consultative Committee on International Telephony and Telegraphy's standard for connecting E-mail systems, and X.500, the CCITT's emerging directory services standard.

The effort will produce a common interface to which E-Mail and protocol software vendors can write. With the interface, customized links will no longer be required between one company's E-mail software and another company's implementation of X.400 or X.500.

If vendors adopt the interface, users should be able to exchange messages across enterprise or intercompany nets spanning dissimilar network environments.

"Software developers will only have to write to one API," said Phillip Whalen, vice-president of marketing for X.400 APIA charter member cc:Mail, Inc. "It will let customers mix and match application and network-protocol products, rather than getting stuck with a particular vendor's implementation."

Currently, the various X.400 protocol vendors each have their own set of hooks for application developers to use. A firm that has decided to use Retix's X.400 implementation, for example, is restricted to E-mail packages such as cc:Mail that specifically support the Retix APIs, Whalen said.

Replacing such custom APIs with a single set of APIs for both X.400 and X.500 "will simplify the implementation of global person-to-person and company-to-company communications systems," said Jim White, principal of Rapport Communication, Inc. and technical coordinator for the X.400 APIA.

Guaranteed acceptance

Peter Janecek, manager of connectivity strategy for X/Open, said the combined forces of his organization and X.400 APIA "will guarantee that these standards are not only created, but that they are widely accepted by the world's largest vendors and electronic mail suppliers."

The two groups will focus their atten-

IBM, Motorola partner in net venture

continued from page 4

"It's a technology that we think has incredible promise," said James Ellis, vice-president of telecommunications at New York Life. "You're talking about having a connection to a mainframe, distributed processors or whatever you need, anytime you need it, available to you 24 hours a day, wireless."

The 4.8K bit/sec data communications service will be supported by more than 1,100 radio transceiver stations across the country, said Jack Blumenstein, president and chief executive officer of ARDIS.

Each base station, in turn, is linked via leased lines to a Motorola Network Control Processor (NCP) packet switch at one of 30 regional concentration sites. The Motorola NCPs are linked to a net control center in either Chicago or Lexington, Ky., both of which house mainframes that track network usage, terminal logon authorizations and support billing.

Customers' host processors link to the network via leased lines or public packet network connections to Tandem Computers, Inc. communications controllers in Chicago, New York or Los Angeles. The controllers are either hardwired or linked via leased lines to NCPs.

Blumenstein said ARDIS is different from satellite-based data communications systems because it can be used to transmit longer messages and it uses 800- or 900-MHz radio bands that work indoors as well as outdoors.

ARDIS is not the first to announce a radio-based public data network, although its network is by far the most expansive. RAM Mobile Data, Inc. is building a radio network that will serve the top 50 U.S. metropolitan areas beginning in the fourth quarter, said Eddi Looy, RAM's vice-president of business development.

RAM has published specifications for the RF modem required to use its network, but Motorola will not, meaning Motorola will be the sole supplier of modems for its net.

IBM last week demonstrated a prototype version of a laptop personal computer outfitted with a Motorola RF modem. Other vendors, including Apple Computer, Inc. and Zenith Data Systems Corp., are working to incorporate the modem into their personal computers, Blumenstein said.

ARDIS will be commercially available in April. The cost of the service varies depending on usage, but Blumenstein said an average user would spend between $100 and $150 per month in usage fees. The Motorola terminal costs about $3,000.

tion on specifications that address three areas:

- An X.400 API that allows such X.400 messaging capabilities as submission, delivery and retrieval to be incorporated into nonmessaging applications such as word processing and spreadsheets.
- An X.500 API through which global directories based on the X.500 standard can be accessed from within the nonmessaging applications.
- An X.500 data base API that allows existing directory data bases, such as telex and telephone directories, to be included in an X.500 directory.

X/Open and the X.400 APIA said they will submit the joint API specifications to the Institute of Electrical and Electronics Engineers, Inc. for approval.

The X.400 APIA last week announced that six more companies, including three key network operating system vendors, have joined the association, bringing the total membership to 23. The new members are Banyan Systems, Inc., Data Connections, Inc., Microsoft Corp., Nippon Telephone and Telegraph, Ltd., Novell, Inc. and TITN, Inc.

The X.400 APIA was founded in December 1988 to develop a common set of X.400 APIs. X/Open, which dates back to 1984, has a broader mission of developing a vendor-independent common applications environment that incorporates both de facto and official standards.

"The joint development agreement elevates the work of X.400 APIA to a higher level," Whalen said.

Upping net security may do more harm than good in virus battles

By Joe Panepinto
Staff Writer

NEW YORK — Speakers at a computer security conference here last week warned users that some prescriptions for combating network infections may end up killing the patient.

Hype about mischievous and malevolent hackers and cyberpunks, fueled by the felony conviction two weeks ago of Robert Morris, author of the disruptive Internet worm, has network users scared about the threat of viruses, worms, trojan horses and logic bombs that may disrupt or crash their systems. But speakers at the conference, titled "Threats to Computer Networks: Piracy, Terrorism and Espionage," warned that increasing network security may make systems more difficult to use and could limit free communication among users. The conference was sponsored by the New York Law School's Communications Media Center here.

"One problem that may arise is that users will find a network too user-unfriendly and just not use it," said Anne Wells Branscomb, keynote speaker and a research associate at the Harvard Program on Information Resources Policy.

Simply restricting access may make networks less friendly to end-users. Patrick McDonough, an attorney at AT&T and president of the American Bar Association's Commission on Computer Crime, gave an example of the security/access trade-off.

He detailed a two-tier security system designed for a client with a wide-area net that involved a simple repeated logon and password procedure. A successful logon at each tier allowed the user access to increasingly sensitive information.

However, to make the system more secure, the network manager is being forced to add a third tier of security authorization. Such an identification and authorization system, McDonough admitted, sacrifices ease of use for greater, but by no means airtight, security.

Abraham Mund, president of Business Research and Information Networking Services International, Inc. in New York, noted that Morris was an authorized user of Internet when he released the worm and caused $98 million in damages.

"This problem is like a balloon," McDonough said. "The more you squeeze it in one area, the more it pops out in another."

Jitters about network security have literally given rise to a new industry focused on providing viral diagnoses and other remedies ("An ounce of prevention," *NW*, July 17, 1989). The number of identified viral infections rose from 3,000 in early 1988 to more than 30,000 today, according to the Association of Data Processing Service Organizations.

Companies are not only offering a host of data encryption options for local and private networks, they are also discouraging users from sharing programs that have not been thoroughly checked out by a third party for fear they may carry a computer infection.

That's a problem, the panelists agreed, because such sharing and open communication among computer professionals has been the lifeblood of the industry — encouraging creativity through the interchange of new ideas.

"You can lose the utility of the whole system if you make it very user-unfriendly," Mund said.

He suggested harsh penalties, such as the denial of college degrees, heavy fines and jail terms, for hackers like Morris. Such penalties, he says, along with simple security measures like varying passwords and the careful selection of foreign programs, would go a long way toward putting a dent in the number of computer infections network managers face.

See the FAXNeT Form on Page #108

Novell rallies third-party suppliers to show support for NetWare 386

Attempts to reassure users that product has industry backing.

By Susan Breidenbach
West Coast Bureau Chief

SANTA CLARA, Calif. — Novell, Inc. last week mustered 25 vendors at a conference here in an effort to convince users that NetWare 386 is garnering significant third-party support.

NetWare 386, released late last fall, is billed as the eighth generation of Novell's industry-leading network operating system. But it is actually a complete rewrite of the product and has been generating first-release jitters among even veteran NetWare users.

"You're using NetWare 386? Really?" was a typical response, accompanied by widened eyes, when attendees sitting around lunch tables at the NetWare users conference compared notes and discovered they had a pioneer in their midst.

Pioneer spirit lacking

To instill the pioneering spirit into more customers, Novell executives told users that third-party software developers and hardware manufacturers have been quick to jump on the NetWare 386 bandwagon.

"Third-party activity has far exceeded our expectations and is at least double what we've seen on any other product release," said Mark Calkins, vice-president of sales for Novell. He directed attendees to a small exhibition in which vendors were demonstrating a variety of NetWare 386-compatible products.

Seven board manufacturers showed network interfaces that already have NetWare 386 drivers certified — or in the process of being certified — by Novell for use in NetWare 386 servers.

These included Ethernet adapters from Gateway Communications, Inc., Tiara Computer Systems, Inc. and Western Digital Corp., as well as token-ring boards from Proteon, Inc. and Racore Computer Products, Inc.

Thomas-Conrad Corp. displayed NetWare 386-compatible Arcnet boards. The company told current users they can download NetWare 386 drivers from a bulletin board, free of charge. Codenoll Technology Corp. was on hand with its fiber-optic Ethernet and Fiber Distributed Data Interface boards, which are now available with NetWare 386 drivers.

Tape-backup vendor support

Tape-backup vendors have been quick to support NetWare 386, possibly because it is the first version of NetWare that allows tape-backup drives to be attached directly to the file server.

Advanced Digital Information Corp. and GigaTrend, Inc. were demonstrating Novell-certified tape-backup units, and Emerald Systems Corp., Mountain Computer, Inc., Palindrome Corp. and PropellerHead Software said they would soon have versions of their tape-backup software that will run as NetWare Loadable Modules (NLM) under NetWare 386.

NetWare 386 has also attracted Fujitsu America, Inc., the leading supplier of mainframe disk drives, into the microcomputer server market. The company told attendees it is writing a NetWare 386 driver, scheduled for release by the end of the current quarter, for the StorEdge tape/disk subsystem it currently sells into the Digital Equipment Corp. MicroVAX environment.

A Small Computer System Interface (SCSI) device, the StorEdge unit can be configured with up to three 780M-byte hard disks for a total of 2.2G bytes of storage, or two hard disks plus a tape drive that support 220M-byte, ½-in. tape cassettes.

Disk subsystems at the exhibition that have already received NetWare 386-compatibility certification were Icon International, Inc.'s Icon Virtual Disk Subsystem and new Icon 1800 Intelligent Disk Server products, as well as Storage Dimensions, Inc.'s LANStor line. When maximally configured with seven of Seagate Technology's new 1.2G-byte hard disks, the Icon 1800 provides more than 10G bytes of on-line storage that can be accessed as fast as .1 msec.

Vortex Systems, Inc. was at the Novell event with its RetroChron board, which contains three discrete SCSI controllers and channels. It provides file servers with continuous, transparent backup so they can be entrusted with "mission-critical" on-line transaction-processing (OLTP) applications.

The RetroChron board supports both magnetic and optical disks, and its accompanying software is now available as an NLM for NetWare 386.

Another available NLM aimed at ensuring hardware reliability is Elgar Corp.'s LANSafe 3.0, software that is used with the company's uninterruptible power supply systems.

Three data base vendors — Informix Software, Inc., Oracle Corp. and XDB Systems, Inc. — were on hand at the exhibition to pitch the features of their forthcoming data base server NLMs to users. None of them were actually showing server software, though XDB Systems seems to be closest to a release.

While Oracle is "shooting for June" and Informix doesn't expect to reach the mar-

(continued on page 111)

Timeplex unveils T-3 mux, offerings

continued from page 2

equivalent of 360 T-1s. The TX3 can be configured in a mesh design and has the ability to route around failed nodes or links, unlike some existing point-to-point T-3 multiplexers.

The TX3 was under development by Broadband Telesystems when Timeplex acquired the company last year.

Some analysts criticized the TX3 because users cannot upgrade from the Timeplex Link family of T-1 multiplexers to the TX3, and because the TX3 cannot be managed by Time/View 2000, Timeplex's high-end network management system.

But analysts applauded Timeplex for announcing the products near or on their ship dates, unlike the company's Time/View 2000 and high-end T-1 multiplexer, the Link/100.

David Woodall, Timeplex's vice-president of worldwide marketing.

Both were announced long ahead of their scheduled ship dates, which they missed by a long shot.

"The good news is that all the products are verifiable," said Timothy Zerbiec, a principal with Vertical Systems Group, a Dedham, Mass., consultancy.

The Time/LAN products are already being used at customer sites. The TX3/SuperHub has not been shipped to test sites, although it is far enough along in the development cycle that Timeplex is confident it will make its target ship date in June, said Dewaine Osman, the new Timeplex president.

Asked if the June ship date for TX3 and the immediate availability of the Time/LAN 100 products was a reaction to the problems the company experienced with ship dates, Osman said, "Absolutely. You can take that to the bank. I'm going to err in being conservative with commitments."

David Woodall, Timeplex vice-president of worldwide marketing, said the company decided on a new architecture for

Timeplex President Dewaine Osman

the TX3 because the T-1 Link architecture was not designed to support T-3 speeds.

The new architecture is based on a high-speed bus that will be upgradeable to the emerging SONET standards, which define transmission speeds from 50M bit/sec to multigigabit speeds over fiber-optic cable.

Some analysts said the new design of the TX3 will not sit well with users of the Link/100.

"They were expecting [the T-3 multiplexer] to be an add-on to the the Link/100," said Vince Barrett, national director of networking consulting at Network Strategies, a network consulting practice of Ernst & Young in Fairfax, Va.

Barrett also said that until Timeplex ships its next-generation Time/View 4000, the company will be missing a network management system that ties all of its products together.

No release date has been announced for the Time/View 4000.

But Zerbiec said that should not be a big concern to TX3 users. Problems on any T-3 link will also affect T-1 links and will be reported to the T-1 network management system.

Network Equipment Technologies, Inc. (NET) could have an edge in that department since its Integrated Digital Network

(continued on page 10)

Timeplex unveils T-3 mux, offerings

continued from page 9

Exchange (IDNX)/90 T-3 multiplexer — the only other commercially available network T-3 multiplexer — is not only upgradeable from the rest of the IDNX line but can also be controlled by the same net management system.

But Timeplex's offering is compatible with the M28 carrier standard, which divides a T-3 into 28 T-1s. That makes it compatible with carrier services that require a T-1 interface and with any other T-1 multiplexer, not just Timeplex's own. NET said its IDNX/90 is also compatible with any other vendor's T-1 multiplexer.

The IDNX/90 is also nonsubrated, which means users can divide the 45M bit/sec T-1 bandwidth into whatever fractions they need, rather than just 1.544M bit/sec channels.

Also, the IDNX/90 uses the same interface cards as other IDNX multiplexers, which means it can support interface speeds lower than T-1. The TX3 supports only T-1 and T-3 interfaces.

The TX3 features automatic rerouting based on time of day, preprogrammed network outage scenarios or commands from the TX3/SuperHub Element Management System. The TX3 stores up to eight network configurations and can route over a backup facility in less than 5 msec.

The price of the product varies according to configuration but typically ranges from $29,950 to $80,000.

Timeplex unwraps internetwork tools for FDDI, other local nets

NEW YORK — Timeplex said it expects traffic feeding into its new TX3/SuperHub T-3 multiplexer may well come from Fiber Distributed Data Interface (FDDI) networks supporting high-bandwidth applications such as imaging and computer-aided design and manufacturing.

To support those FDDI networks, the company developed its Time/LAN 100 family of concentrators and routers.

The Time/LAN 100 FDDI Concentrator+ can link up to eight devices, such as workstations or routers, to a dual-ring FDDI network. Network administrators can add or remove devices from the concentrator without interrupting other users on the network.

Gregory Langford, Timeplex's assistant vice-president of product marketing, said the FDDI Concentrator+ brings the price of a connection to an FDDI net down to about $7,000, about half the price of competing products. Analysts said that may be true today, but the price of FDDI connections is expected to drop steadily.

The FDDI Concentrator+ is available now and ranges in price from $30,700 to $36,700.

Timeplex also introduced a series of four Time/LAN 100 Internet Protocol routers. Two of the routers connect either collocated or remote Ethernets supporting the Transmission Control Protocol/Internet Protocol with FDDI networks, while the other two connect either collocated or remote TCP/IP Ethernets to each other.

Timeplex's Gregory Langford

The products support the TCP/IP Simple Network Management Protocol (SNMP), which will convey net management data to the new SNMP-based Time/LAN 100 Element Management System. Time/LAN 100 products cost between $22,500 and $27,000 for the FDDI routers, and between $9,000 and $10,000 for the Ethernet routers.

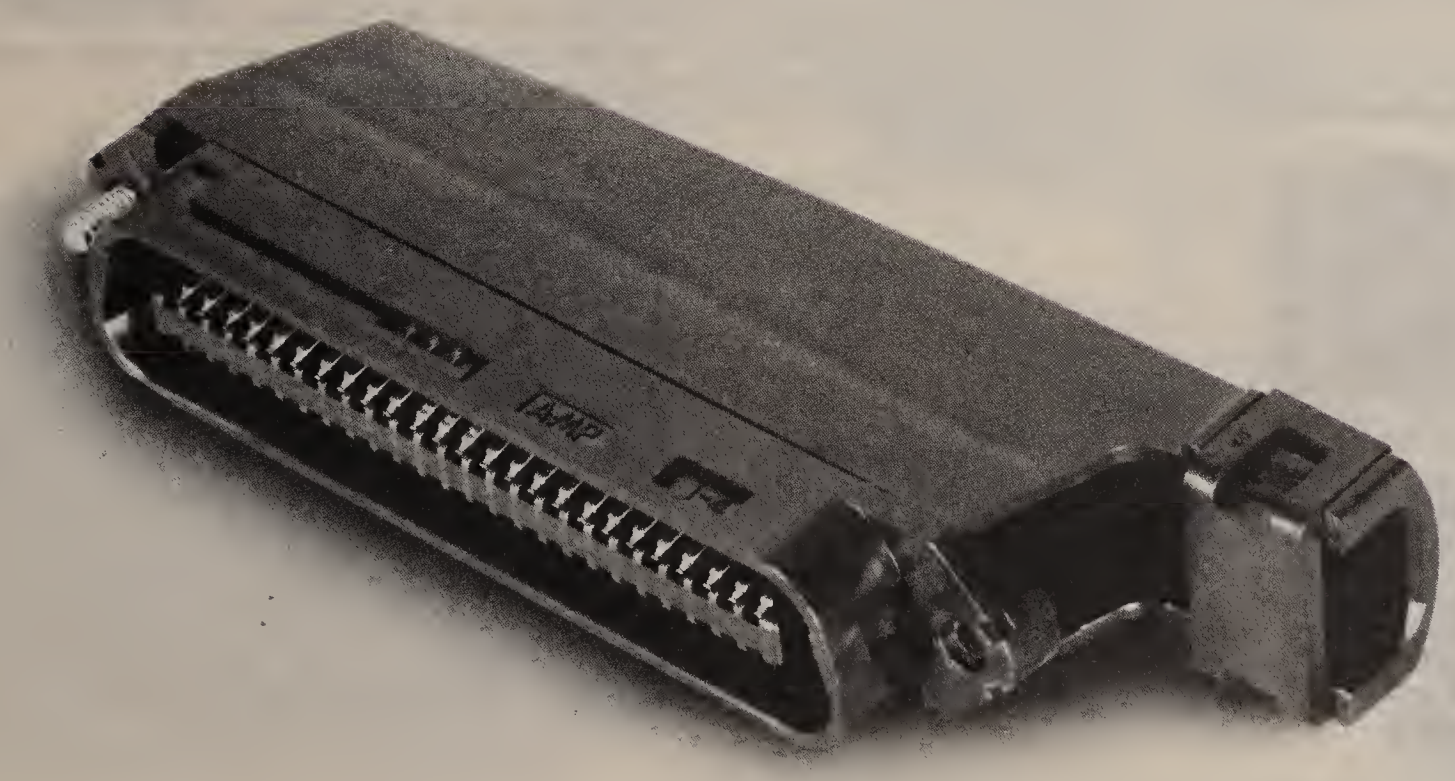
The Strategic Air Command at Offutt Air Force Base in Omaha, Neb., is already using the Time/LAN 100 products, Timeplex said.

Timeplex's Time/LAN 10 family of routing bridges — suppled to Timeplex by RAD Data Communications, Inc. — provide Ethernet-to-Ethernet or token ring-to-token ring connections locally and remotely via T-1 or X.25 links. The products are protocol-transparent, media-access control layer, self-learning bridges and can be managed by the new Time/LAN 10 Element Management System.

Pricing on the Time/LAN 10 family ranges from $8,000 to $12,000.

— Paul Desmond

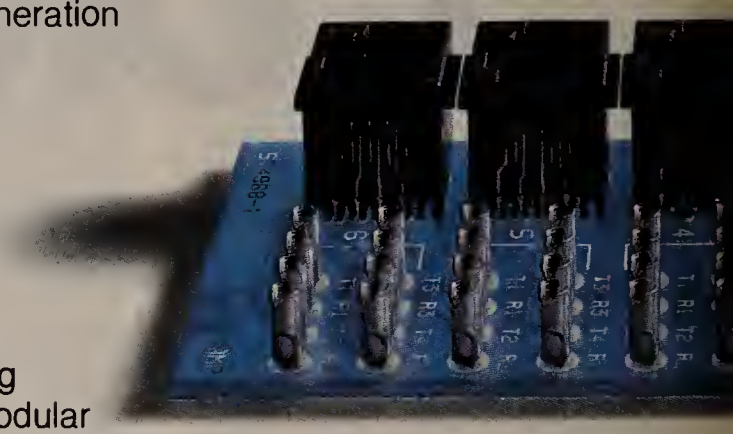
FOR YEARS, OUR NAME STOOD FOR QUALITY CONNECTORS.



TODAY, IT
FOR A WHOL

FDDI connectors and fiber-optic modules provide current applications of next-generation technology.

Interchangeable connector inserts accept equipment from any major vendor, allowing in-office or wiring closet changes in seconds.



Uncomplicated wiring management: our modular cross-connect allows simple "jumper" reassignment for twisted pair voice and data.

Today, you'll find AMP technology every place you look in the networking environment. In fact, we provide and support complete premises wiring packages for any network, regardless of media mix or vendor mix. And we simplify wire management at the same time.

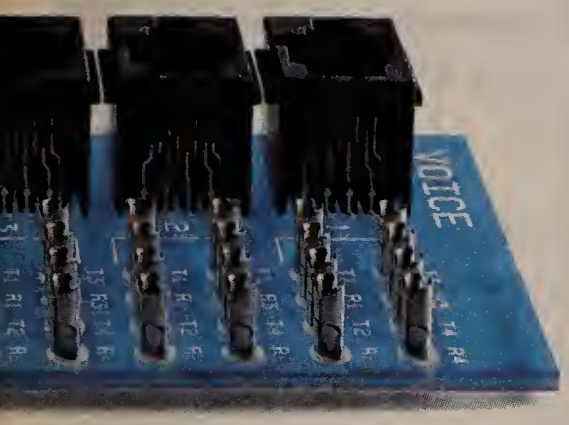
At the desk, our communications outlets adapt to changing equipment with a quick module replacement. In the wiring closet, our twisted pair, coax, or fiber-optic systems reconfigure in seconds.

From network-specific cabling to complete fiber-optic systems, our products reflect our OEM-level involvement with the world's major vendors. They simplify change and growth in your network, and offer the inherent ability to accommodate next-generation technologies.

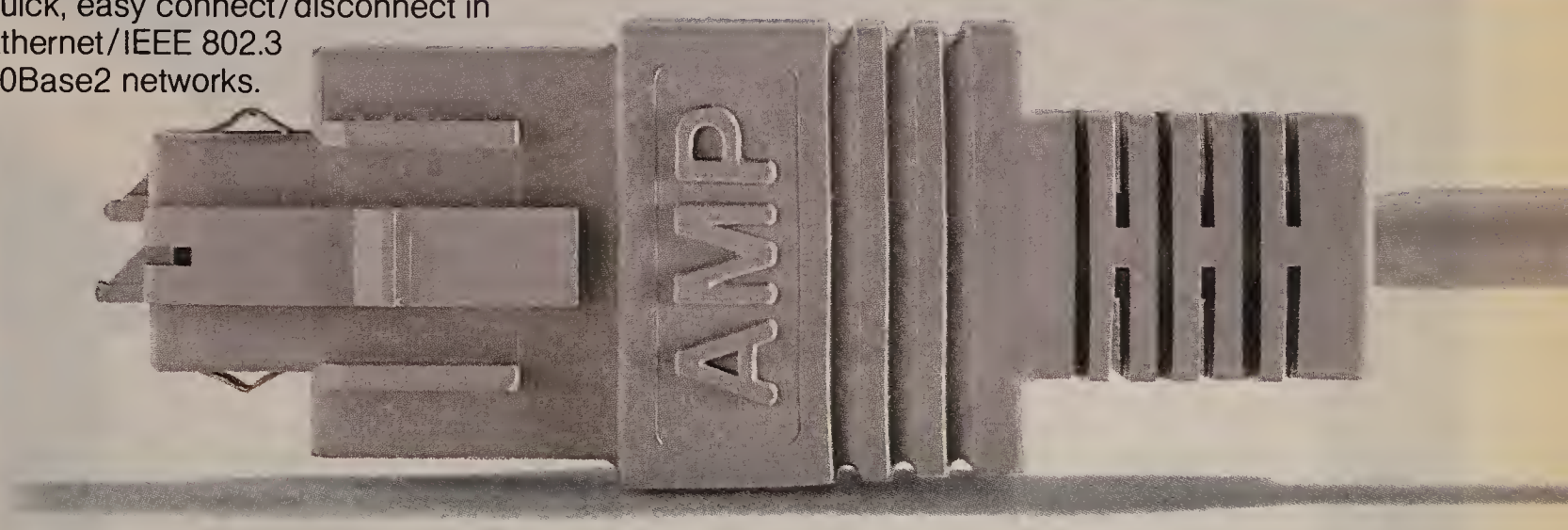
STANDS E LOT MORE.

AMP baluns simplify the interface between coaxial and twisted pair cabling.

Undercarpet power, phone, and data wiring allows quick access and change, with minimal work disruption.

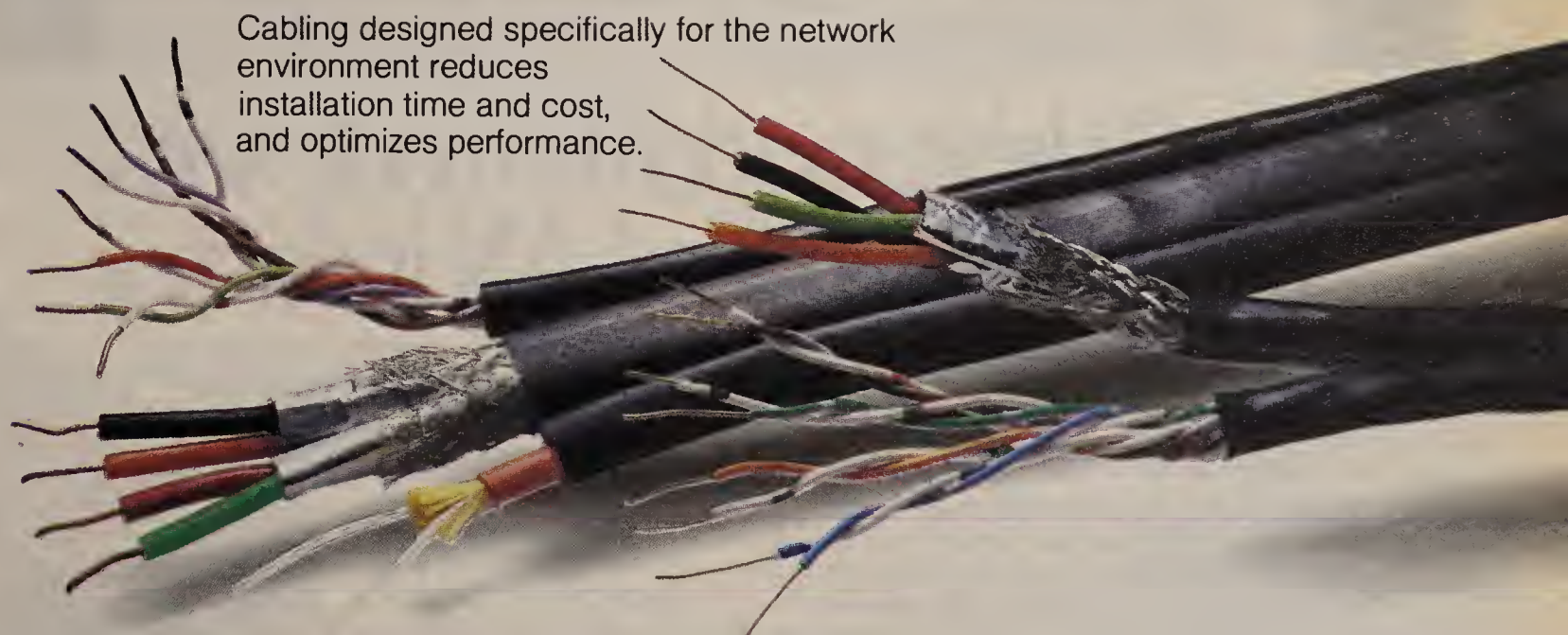


Our Thinnet Tap System features self-shunting connections for quick, easy connect/disconnect in Ethernet/IEEE 802.3 10Base2 networks.



AMP standard and special-purpose patch panels reduce wiring closet complexity, and speed change.

Cabling designed specifically for the network environment reduces installation time and cost, and optimizes performance.



Today, our name stands for the idea that a network should be robust at its most fundamental level — and that premises wiring should be as advanced as the hardware it supports.

For more information and the name of the AMP Network/Premises Distributor or Integration Partner near you, call our Product Information Center at 1-800-522-6752. AMP Incorporated, Harrisburg, PA 17105-3608.

THIS IS AMP TODAY. **AMP**

Pioneering hospital becomes first user of Northern Tel's Meridian 1

Brooklyn's Maimonides Medical Center readies for cutover of 3,200-line switch that will support voice, data applications.

By Bob Wallace
Senior Editor

NEW YORK — Maimonides Medical Center, site of the first U.S. heart transplant, will record another first on Feb. 27 when it cuts over a 3,200-line Northern Telecom, Inc. Meridian 1 PBX.

Maimonides will be the first user of the new private branch exchange, which the prominent medical center chose because it is smaller, easier to expand and could be installed sooner than competing products, including AT&T's Definity Generic 2.

Northern Telecom unveiled the Meridian 1 line of modular PBXs at a press conference across town last week. The new product line replaces the vendor's current Meridian SL-1 and SL-100 PBXs.

The medical center will use the Meridian 1 to switch voice and data, including high-bandwidth applications such as image transfer. Switch-to-computer links will be used as a base for development of advanced patient services.

The nine-module Meridian 1 will replace the medical center's Rockwell ATX PBX, which is in critical condition, according to Bruce Nauman, a managing partner of Synexus, Inc., a Philadelphia-based voice and data communications consultancy hired to help the medical center acquire the new system.

"The machine is dying. It's been going down for two to three hours at a time. It was imperative that the new switch be installed as quickly as possible," Nauman explained. The GTX is presently overburdened at 2,500 lines.

Akiba Keehn, administrator of MIS at Maimonides, said, "The Meridian 1's architecture allows us to expand in the time frame we need without pushing out the walls of our PBX room."

The Meridian 1 will anchor a two-block campus-style network, which will support buildings not served by the current PBX and sites acquired as part of the center's aggressive acquisition plan.

The cutover calls for coaxial cable to be replaced with unshielded twisted pair in seven large buildings, numerous brownstones and smaller offices, as well as other structures. The sites will be networked with fiber. Information Transport Systems, Inc. of Burlington, Mass., will handle cable management for the project.

In addition to supporting voice, the PBX will handle asynchronous personal computer-to-personal computer communications, as well as links between personal computers, minicomputers and mainframes, according to Nauman.

Maimonides said in its request for proposal that the entire network project, including the extensive rewiring effort, must be completed four months after the contract was awarded, Keehn said. The hospital awarded the contract in October 1989.

"We're under the gun to get the new system and the best technology in and operational. All the vendors knew this," he said. "Northern Telecom was able to make commitments that others couldn't. We felt comfortable with them."

> "Traffic capacity had always been Northern Telecom's Achilles' heel. But the SuperLoop changes that."
>
> ▲▲▲

The Meridian 1's architecture, which makes system expansion simple, was impressive, Keehn said.

The basic Meridian 1 building block is a single shelf module that houses 16 digital line cards, each supporting 16 voice and 16 data ports, for a total of 512 ports. The modules measure 32 by 26 by 21 inches and can be stacked to build larger systems.

The new Meridian SuperLoop, which ties the shelves to the system's switching matrix, quadruples the number of time slots available for voice and data traffic from 30 with the SL-1 to 120 with the Meridian 1.

"Traffic capacity had always been Northern Telecom's Achilles' heel. But the SuperLoop architecture changes that," Synexus' Nauman said.

Pricing was not a major factor in the medical center's decision to buy the new Northern Telecom switch, according to Nauman. "If you rank priorities on a scale of 1 to 10, with 10 being the most important, pricing was a 3 or 4," he said.

The medical center's Meridian 1 will be equipped with a fully redundant processor and backed up by a used 200-port SL-1 PBX, which would provide calling services from critical stations if the main switch fails, Keehn said.

The medical center will use Meridian Mail, Northern Telecom's PBX-based voice mail system, which requires a dedicated module. Maimonides' Meridian 1 will also support several small automatic call distributor groups of less than 25 agents.

Worth Noting

In its fiscal 1989 annual report, Hewlett-Packard Co. revealed that its internal operations are supported by 2,500 minicomputers and 85,000 personal computers, workstations and terminals linked into a global communications network. The net is used by most of HP's 95,000 employees.

People & Positions

Michael Spindler last week was named to the newly created position of chief operating officer and executive vice-president at **Apple Computer, Inc.**, the Cupertino, Calif.-based microcomputer firm.

John Sculley, who is chairman and chief executive officer of Apple, said Spindler will help Apple coordinate business operations while streamlining the company's day-to-day activities.

The Apple USA, Apple Pacific, Apple Europe, Worldwide Product Marketing and Worldwide Manufacturing business operations will report to Spindler.

He will report to Sculley.

Previously, Spindler was president of Apple Europe. The company said it expects to announce a replacement for Spindler shortly.

William Joy, vice-president of research and development for **Sun Microsystems, Inc.,** recently was presented with the 1990 UniForum Industry Award in Washington, D.C.

The award is in recognition of Joy's work in the advancement and acceptance of the Unix operating system.

UniForum is a nonprofit, vendor-independent trade association dedicated to promoting network environments running Unix and open systems.

Upstart NetWare users group to lure corporate backers

ANU seeks more endorsements at Networld '90.

By Walter Sweet
West Coast Correspondent

BOSTON — The Affiliation of NetWare Users (ANU), an upstart group of Novell, Inc. NetWare users, will meet here next week at Networld '90 Boston in an effort to beef up its membership.

The group is hoping to court NetWare users who are willing to start local or regional chapters, according to Glenn Fund, ANU president. ANU is also seeking endorsements from major corporations that use NetWare.

Until now, individual network managers — not acting as corporate representatives — have banded together to form ANU and start a grass-roots membership drive.

> ANU now has 20 members. It is looking to add supporters in the Midwest and Canada.
>
> ▲▲▲

Novell president and chief executive officer Ray Noorda is expected to endorse the user organization at Networld.

ANU was formed last May by disgruntled members of the NetWare Users International (NUI), a NetWare users group funded by Novell.

Several users on the NUI board, who were upset that the group had little influence on Novell product plans, were apparently asked by Novell to leave NUI because they had voted to sever existing ties with the vendor and set up an independent organization that would call for specific improvements to NetWare products, Fund said.

According to Ed Sawicki, an ANU interim board member and president of the Portland, Ore., NUI chapter, there is no pipeline for an NUI chapter to be heard at Novell.

He said he hopes this will change as ANU builds its strength in numbers and help influence enhancement and product decisions made by Novell.

Although there had been talk about forming an independent users group for almost a year, the organization didn't establish an interim board of directors until about two months ago, Fund said. ANU now has 20 members throughout the country and is looking to add supporters in the Midwest and Canada to broaden its base.

Fund said he was president of the NUI until last May, when No-

(continued on page 20)

INDUSTRY BRIEFS

MCI Communications Corp. last week reported that net earnings for the fourth quarter, ended Dec. 31, 1989, dropped 11.5% to $108 million, down from $122 million in the fourth quarter of 1988, sending its stock price tumbling.

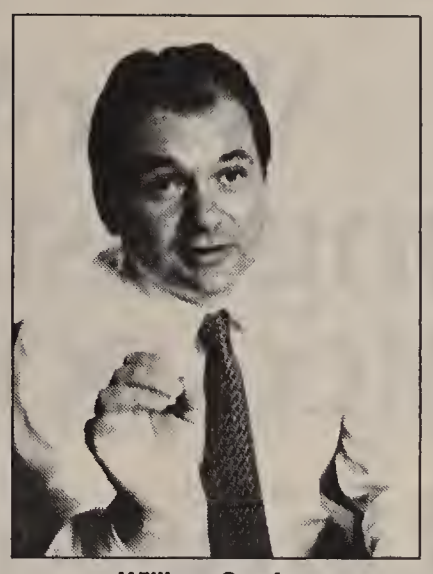
The fourth-quarter earnings were reduced by a pretax charge of $35 million for consolidating engineering operations in Texas and by an aftertax charge of $35 million for early retirement of debt. Revenue for the quarter was $1.71 billion, up 19.6% compared to $1.43 billion in revenue reported in the comparable quarter last year. However, this quarter's results are only up 2.4% from the $1.67 billion in revenue recorded in the third quarter, a figure that reflects price competition in the market, MCI officials said.

Investor reaction to the sluggish growth figure sent the carrier's stock plunging $3.12 to close at $31.25 last Tuesday.

Despite slow growth in the fourth quarter, MCI's yearend revenue was up 25.9% from $5.14 billion in 1988 to $6.47 billion this year. Earnings for 1989 were $558 million, up 61.3% from $346 million reported in 1988.

MCI attributed its improved yearly results to increased demand both by large business users and residential users. MCI was awarded large contracts during the fourth quarter by J.C. Penney Co., Inc. and Computer Associates International, Inc., among others.

(continued on page 20)



William Carrico

Chuck Stein

Rising stars: Vendors that may shape nets

Industry observers single out key net start-ups that hold technological edge over competitors.

Quite a few start-up network equipment vendors made their mark during the last decade, shedding their image as suppliers of leading-edge but unproven equipment.

Some, such as T-1 multiplexer maker Network Equipment Technologies, Inc., local-area network vendors Novell, Inc., 3Com Corp. and Banyan Systems, Inc., and voice-messaging equipment provider Octel Communications Corp., helped define new markets.

Network World *Senior Editor Bob Brown and Washington Correspondent Gail Runnoe polled industry observers and venture capitalists and came up with a list of the companies that will likely have an impact on user nets in this decade.*

This week, in the first of two parts, Network World *examines five of those 10 companies.*

ALANTEC

- **Based:** Fremont, Calif.
- **Founded:** May 1988
- **Product focus:** LAN/WAN internetworking products.

In an increasingly crowded market for internetworking products, Alantec will attempt to stand out by delivering bridging and switching products that provide a migration path to Fiber Distributed Data Interface (FDDI) nets.

Alantec's MultiLAN Switch, for example, supports communications among as many as 10 local-area networks at a rate of 50M bit/sec. The product also features a T-1 interface that links as many as eight LANs to a T-1 line.

Edward Snyder III, who was named Alantec's president and chief executive officer last month, said Alantec's products will provide "an immediate answer for users that do not want to wait to tie their LANs together with FDDI-based products."

During 1989, Alantec introduced new bridging products with logical filtering, a technique not used by most other vendors, Snyder said. Logical filtering enables a network manager to improve network performance and security by controlling bridge functions on a packet-by-packet basis to keep, for example, local messaging traffic local or to isolate some areas of the network from incoming traffic.

According to James Breyer, an associate partner at Accel Partners, a San Francisco-based venture capital firm, Alantec's strength is the migration path it gives users to FDDI.

"I see a lot of press on the coming of FDDI, but the cost of it is still prohibitive," Breyer said. "Rather than invest large sums of money in FDDI, users are looking for a less expensive interim solution to get more bandwidth until the cost of FDDI comes down."

ASPECT

- **Based:** San Jose, Calif.
- **Founded:** August 1985
- **Product focus:** Automatic call distribution products.

Aspect Telecommunications Corp. is expected to be a rising star in the automatic call distributor (ACD) market because of the way it has integrated so many capabilities into one system.

The Aspect CallCenter is a

(continued on page 17)

Who's the leading long distance vendor for integrated network management?

Hands down, it's AT&T.

Did you know, in a recent survey conducted by the Business Research Group, AT&T was chosen overwhelmingly as the leading long distance vendor over MCI® and US Sprint® by MIS executives asked to rate network management providers?

It's no wonder. For complete end-to-end network management, no other telecommunications vendor can match AT&T; our Unified Network Management Architecture is the most comprehensive and flexible framework for end-to-end network management in a multivendor environment. So you can count on our strong commitment to multivendor, OSI-based solutions. In fact, the MIS executives participating in the Business Research Group study rated AT&T as the vendor most closely adhering to OSI standards for integrated network management.

With AT&T, you can get more control over your network. Because included in our family of integrated network management offerings is ACCUMASTER℠ Network Management Services—the most comprehensive array of information and control functions, providing you with Configuration Management, Fault Management, Performance Management, Accounting Management and Network Planning.

ACCUMASTER Network Management Services are available today for use with over 20 AT&T Business Services, including AT&T Software Defined Network Service, AT&T 800 Service and ACCUNET® T1.5 Service.

If you're looking for end-to-end network management, why look to anyone other than the leading long distance vendor?

Network Management. Another AT&T advantage.

For more information about AT&T's integrated network management, call your AT&T Account Executive or **1 800 526-8840**.

AT&T
The right choice.

Rising stars: Vendors that may shape nets

continued from page 15

stand-alone ACD serving organizations with requirements for operating telephone sales and support centers that handle from 1,000 to 70,000 incoming and outgoing calls per day. Typically, the ACD product hooks up to a customer's private branch exchange.

Aspect's offerings stand apart from ACD products touted by the big PBX vendors, many of which put more effort into building their PBXs, said Dennis Haar, Aspect's vice-president of marketing. For example, while other vendors require a user to buy voice-recognition and voice-messaging products separately from an ACD, Aspect packages all of these capabilities together, he said.

Aspect has also focused on building popular features such as interfaces to Integrated Services Digital Networks and to computers, Haar said. While other vendors are doing the same thing, Aspect claims it has done a better job as a result of focusing predominantly on building ACD products.

Andy Schopick, vice-president of new business development at New Science Associates, Inc. in Southport, Conn., said Aspect has been successful in developing a presence in both the U.S. and U.K., as well as in providing cost savings and improved features, compared to more experienced players in the market. One danger that looms, however, is the possibility that the regional Bell holding companies will begin offering ACD-type services en masse and make stand-alone systems less necessary, he said.

"We'll have to see how much ACD services become standardized as carrier offerings," Schopick said.

CISCO SYSTEMS

- **Based:** Menlo Park, Calif.
- **Founded:** May 1988
- **Product focus:** Multiprotocol routers, terminal servers.

By offering multiprotocol routers that support more protocols than any competing vendor, cisco Systems, Inc. has staked out an early lead in the high end of this LAN interconnection market.

Protocols supported by cisco Systems include the Transmission Control Protocol/Internet Protocol, X.25, Digital Equipment Corp.'s DECnet, Apple Computer, Inc.'s AppleTalk, Open Systems Interconnection and Xerox Corp.'s Xerox Network Services. Support for such a broad range of protocols is crucial for users interconnecting multiple networks, analysts said.

In addition to selling high-end multiprotocol routers, cisco Systems provides users with a broad line of offerings that includes combination bridge/routers, terminal servers and gateways that also handle protocol conversion. Its hardware and software products feature a high degree of modularity, a company spokesman said.

Since the internetworking market is so young, having a broad range of offerings is attractive to innovative users, he said.

Burgeoning user interest in internetworking products helped to boost cisco Systems' sales to $27.7 million last year, more than four times its $5.4 million in sales for 1988. The company's growth should enable it to invest in further enhancements so that it will be able to compete against traditional network equipment vendors that are just beginning to gear up their LAN interconnection offerings, observers said.

"Cisco [Systems] is in a fairly hot market," Schopick said. "They've done well to establish themselves as the preeminent provider of high-class routers. They'll have to stay on their toes, though, to fight off a lot of competitors."

By keying in on serving users with complex network integration needs, cisco Systems has built up a customer list that includes large users, such as AT&T, The Boeing Co. and Northern Telecom, Inc.

NETRIX

- **Based:** Herndon, Va.
- **Founded:** October 1985
- **Product focus:** Integrated packet/circuit switches.

Netrix Corp. appears to have found the right mix — a combination of X.25 packet-switching, circuit-switching and T-1 multiplexer technology in the same switch.

With users increasingly moving to consolidate their diverse networks, the primary Netrix switches unveiled two years ago are starting to look particularly attractive, analysts said.

The #1-Integrated Switching System from Netrix enables customers to consolidate technologies as diverse as X.25, IBM's Systems Network Architecture, Digital Equipment Corp.'s DECnet and voice traffic into a single network.

Jim Anderson, a general partner at the Palo Alto, Calif.-based venture capital firm of Merrill, Pickard, Anderson & Eyre, said Netrix has an edge over other competitors because it offers "a one-box, rather than a two-box solution like other vendors."

The Netrix switches are also attractive to users that are expanding their networks but are not sure what type of communications links to use.

"What our product allows our customers to do is avoid making a technology decision at the time they buy their network

(continued on page 20)

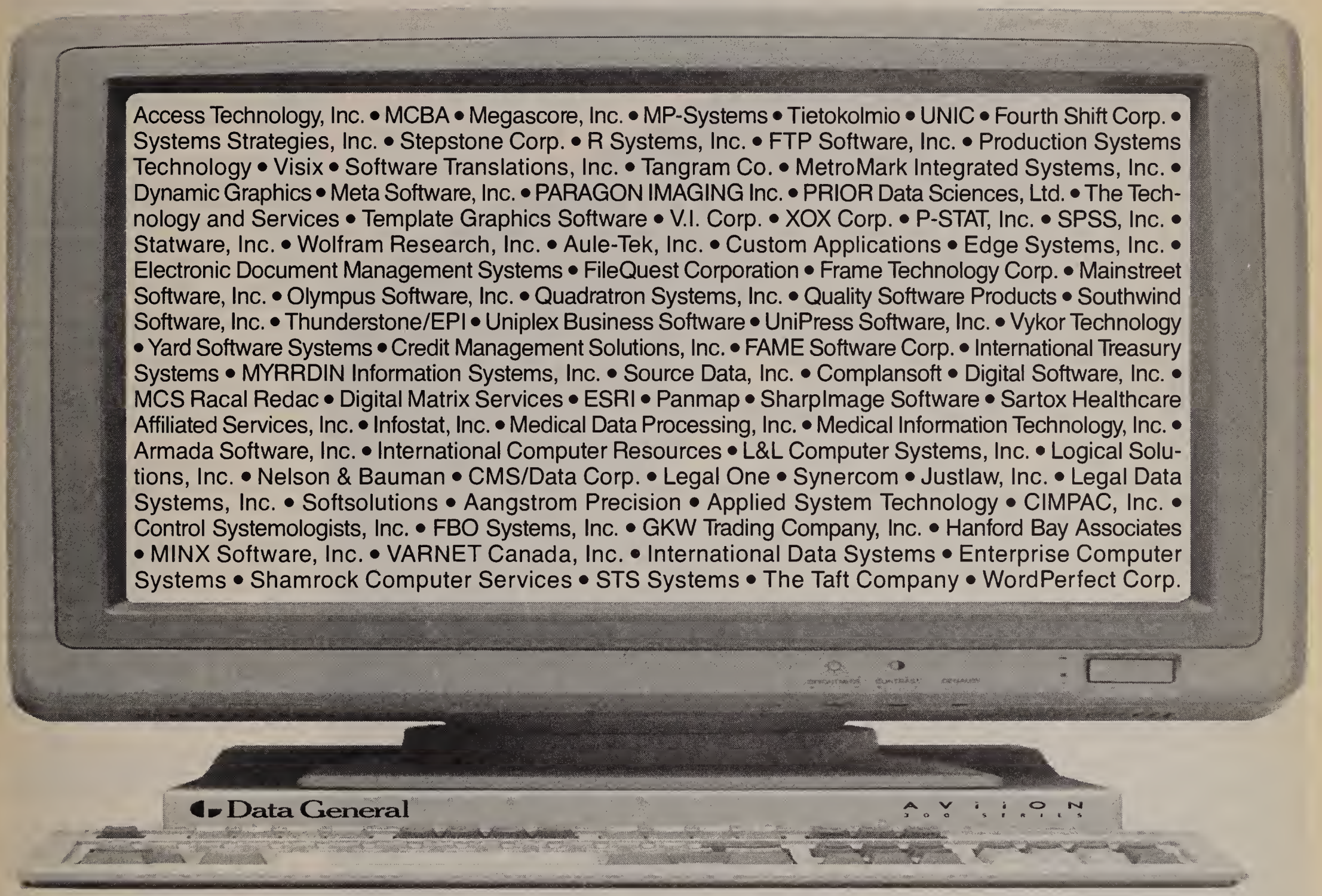
See the FAXNeT Form on Page #108

DEPTH&

88open COMPATIBILITY CERTIFIED

See the FAXNeT Form on Page #108

BREADTH



Data General's AViiON lets you run both.

When you're looking for solutions, choose the UNIX® system-based RISC platform that scores of industry leading software vendors have already chosen: Data General's AViiON™ Family!

There's a deep set of proven utilities, databases, and 4GLs that make developing or porting your own programs as easy as can be. And there's a broad range of applications for industries like banking, insurance, hospital management, accounting and more.

Data General supports the 88open BCS, the industry's only binary standard for multivendor interoperability. That means AViiON is open to the most important networking, communications, and software standards.

Call 1-800-DATAGEN and we'll send you a brochure listing hundreds of third-party software programs available for Data General's AViiON Family.

Name_____

Company_____

Address_____ Phone_____

City_____ State_____ Zip Code_____

Data General
3400 Computer Drive, Westboro, MA 01580

SEE US AT COMNET, BOOTH #780

Rising stars: Vendors that may shape nets

continued from page 17

equipment," said Chuck Stein, Netrix's president and chief executive officer.

NCD — **Network Computing Devices, Inc.**

- **Based:** Mountain View, Calif.
- **Founded:** February 1988
- **Product focus:** X/Windows display terminals.

It took just "nanoseconds" for Network Computing Devices, Inc. (NCD), a maker of X terminals, to get its first round of financing once investors heard industry veterans William Carrico and Judy Estrin were coming aboard in July 1988, recalled one observer.

Cofounders of Bridge Communications and later executives at 3Com Corp., Carrico now serves as NCD's president and chief executive officer, while Estrin is the company's executive vice-president. They have helped attract a total of $17 million in two rounds of financing for what has become the early leader in the X terminal market.

X terminals are desktop devices that off-load applications processing to a host but perform screen management locally, the firm said. Because the terminals lack expensive local processing parts compared to more expensive workstations, they promise to save network users money.

"As one of the early X terminal vendors, we expected to sell primarily into the scientific and engineering market, with commercial users taking several years to embrace X," Carrico said. "Instead, we're already selling into many commercial installations, such as hospitals, law firms and financial institutions, which see X terminals as a cost-effective alternative to high-priced workstations," he added.

With a proven management team and the emergence of client/server computing, "NCD appears to be right there," said Patrick Whelan, an associate at Broadview Associates, an acquisitions and mergers firm in Fort Lee, N.J.

Senior Writer Paul Desmond contributed to this story.

Industry Briefs

continued from page 15

IBM last week announced it is working with nine business partners to develop applications for its ImagePlus system, a device that scans letters and other text-oriented documents into a network-attached computer.

The business partners will configure existing applications so that they can run on the IBM ImagePlus system, which can be linked to IBM Application System/400 minicomputers or Multiple Virtual System/Enterprise Systems Architecture (MVS/ESA)-based mainframes. Multiple workstation, personal computer or terminal users on a network can access the ImagePlus system.

The new ImagePlus applications will address the imaging needs of users in the financial and insurance industries, among others.

Business partners developing industry-specific applications for MVS/ESA environments include Continuum, which will offer client contract administration for life insurance companies, and Policy Management Systems Corp., which boasts a client information system for property and casualty insurance.

Business partners developing ImagePlus applications for the AS/400 environment include ALE Systems, Business Records Corp., Complex Systems, DST Systems, Inc., H.T.E., Inc., McCracken Computer and Professional Impressions, Inc.

The new ImagePlus applications will be developed by year end, according to an IBM spokeswoman. Early versions of some applications will be demonstrated by some of the business partners at the Association for Information and Image Management business show in Chicago April 9 through 12.

Upstart NetWare users group to lure backers

continued from page 15

vell disbanded that board after it voted to become independent from the vendor. He is still a representative of the local Novell users group here.

"As long as Novell insists on managing that users group, they're going to alienate the board," Fund said. "Users don't want to be puppets for Novell."

Fund said ANU will try to provide a voice for users rather than for Novell and its products. "In a LAN, there are third-party products, not just Novell products," Fund said. "You don't need marketing hype, you need real solutions."

As part of its effort to help users, ANU is holding roundtables at NetWorld covering cable system design, local-area network management, implementing a wide-area network, Netware 386, troubleshooting, installing application software, LAN management staffing, multiprotocol LANs, hardware maintenance, disaster recovery and possible enhancements to NetWare futures.

Fund said the group's goal is to become financially independent in two years, although for the first year, ironically, Novell is supplying half the capital to start up the organization. The other half of the funding will come from corporate sponsors.

ANU will meet from 6 p.m. to 7:30 p.m. on Feb. 13 in Room 313 at the Hynes Convention Center. The gathering is open to all NetWare users.

Worth Noting

"We had used smaller carriers' [inbound] 800 services until a year ago, when we decided to use only AT&T. We felt [smaller carriers] could not offer and support advanced services on a nationwide basis. We needed carriers that could support us everywhere we go."

Thomas Parsons
Data communications and network services director
United Services Automobile Association
San Antonio, Texas

Carrier Watch

M&SD Network Services, a division of EDS Telecommunications Services, last week said that **Owens-Corning Fiberglas Corp.** has joined the American Business Network (ABN) Limited Partnership.

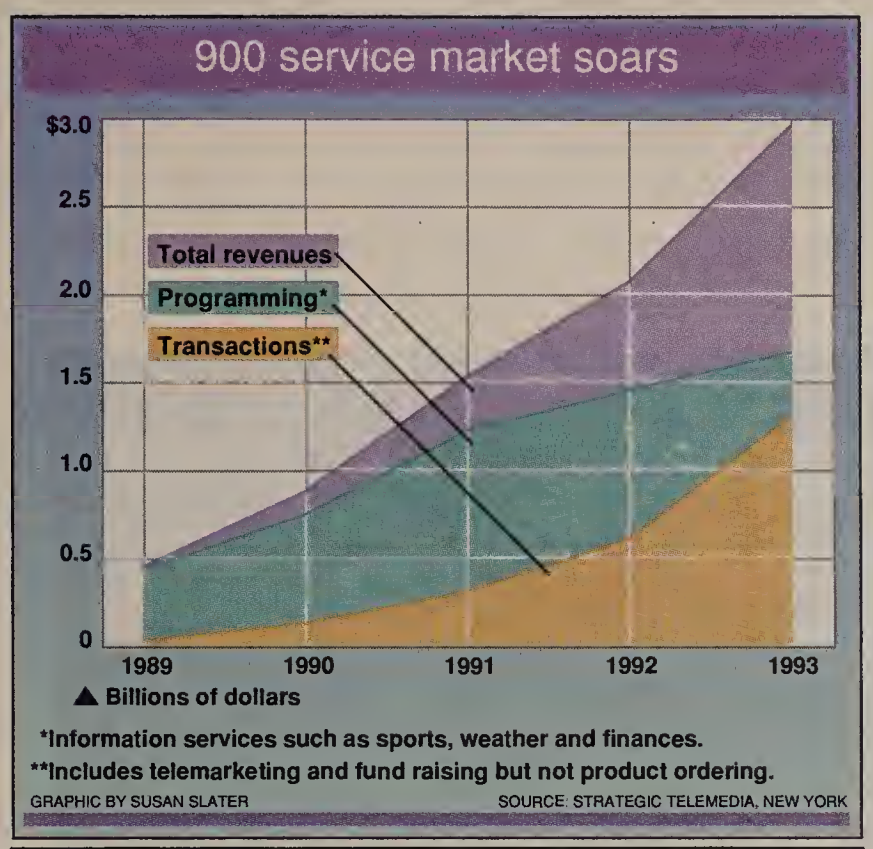
ABN, a buying consortium based in Lyndhurst, N.J., said Owens-Corning joins more than 60 national companies whose combined purchasing power exceeds $2 billion.

Owens-Corning, which employs 15,000 people, operates more than 40 factories in the U.S., sales offices in 70 cities, and subsidiaries and affiliates in 20 foreign countries.

M&SD Network Services, which manages ABN, aggregates traffic and provides discounts on telecommunications and data communications equipment.

Call aggregation deals are available from the major carriers and from noncarrier companies, such as MS&D Network Services, which act as intermediaries between carriers and groups of users that want to pool their traffic to qualify for discounts. Aggregating traffic lets users save up to one-third on standard voice services such as WATS, 800 and virtual net offerings.

(continued on page 26)



Intel to use PBXs to switch video signals across T-1 net

Technology trial will let firm dial up video links.

By Tom Smith
New Products Editor

SANTA CLARA, Calif. — Intel Corp. later this month will begin testing a videoconferencing network that will enable the company to use its private branch exchanges to establish dial-up video connections across its fast-packet T-1 network.

The trial, which will involve use of Integrated Services Digital Network Primary Rate Interface (PRI) technology, represents Intel's second experiment with videoconferencing. It tested videoconferencing in 1987, but the company opted not to pursue it because of the high cost of the dedicated links required and only marginally acceptable picture quality.

"The fact that we'll be switching video through the PBX is fairly novel."

▲▲▲

In this latest experiment, Intel plans to switch video signals through PBXs, establishing circuits on an as-needed basis to sites in Arizona, California, New Mexico and Oregon, according to Donald Melvin, corporate telecommunications senior strategist at the company, based here.

In the trial, Intel will use PictureTel Corp. C3000 coder/decoders (codec) to digitize video images for transmission over two 64K bit/sec links to a local PBX. The PBX will have a PRI connection to an intermediate multiplexer that is connected to a StrataCom, Inc. Integrated Packet Exchange (IPX) fast-packet T-1 multiplexer.

The intermediate multiplexer is connected to the Stratacom IPX, a backbone node, through multiple 64K bit/sec channels — two for video transmission and one for signaling.

This complex setup is necessary because IPXs do not currently support PRI and Intel wanted the extra bandwidth available within PRI channels — 64K vs. 56K bit/sec — to increase image quality.

PRI provides clear-channel 64K bit/sec because the signaling data is carried on a separate channel.

The IPXs maximize bandwidth utilization by removing gaps in transmission, as well as repetitive characters from data streams. They also supply bandwidth on demand, instead of breaking down a T-1 line into 24 channels.

"The fact that we'll be switching video through the PBX is fairly novel, and the fact that we will be doing it over the fast packet network is even more novel," Melvin said.

Randy Smith, vice-president of U.S. sales at PictureTel in Peabody, Mass., said this approach puts Intel "at the forefront" of videoconferencing.

The company reached this position by standing by its convic-

(continued on page 26)

AT&T custom deals raise new concerns

Secret clause in university deal rekindles debate about whether AT&T is making illegal promises.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — The disclosure that AT&T offered to pay the University of Texas $22,000 if the FCC rejected a Tariff 16 deal proposed for the school has renewed concerns that AT&T is making customers illegal promises in its custom network offerings.

The deals AT&T makes under Tariff 16, as well as its other custom network plans, Tariffs 12 and 15, consist of two parts: a tariff that is filed with the FCC containing rates, terms and conditions for the service; and a private contract for the customer.

Competitors have long claimed AT&T is using the privacy of the contracts to shield additional discounts, to offer bundled prices for equipment and regulated transmission services, or to promise other preferential treatment. They have been pressing the Federal Communications Commission to review the contracts to determine if they violate the Communications Act of 1934 or other FCC rules.

AT&T maintains that the contracts are kept secret to protect the customer's proprietary interests and that there are no provisions in the contracts that have a material bearing on rates or conditions of the regulated service. Although the FCC has determined that it has the legal authority to examine the contracts, it has never done so.

Observers disagree about whether or not the FCC will ever look into the contracts.

▲▲▲

Observers disagree about whether or not the FCC will ever look into the contracts. But they unanimously agree that such a move would be a blow to users, since proprietary information about their networks could be revealed during the review.

Although the FCC has since rejected AT&T's Tariff 16 deal for the University of Texas, the issue has fueled the contract controversy because the clause was kept secret in the contract for several

(continued on page 24)

WASHINGTON UPDATE

BY ANITA TAFF

Thumbs down to Tariff 16 offering. The Federal Communications Commission last week rejected as unlawful AT&T's Tariff 16 offer to the University of Texas at Austin. The university was to have been the second customer to purchase service from a Tariff 16 offering called the Government Outbound Calling Plan (GOCP).

GOCP allows government customers to purchase Megacom service at discounted rates. Carriers are allowed to offer special rates to government users, including state universities and municipalities, by provisions of the Communications Act of 1934.

The FCC said AT&T's plan for the university was illegal because it set up rates that were available only to the University of Texas. In addition, the commission said, the rates for the university differed from those offered to the first GOCP customer, the Commonwealth of Pennsylvania.

In its rejection, the FCC chose not to rule on the legality of a promise that AT&T made to pay the University of Texas $22,000 if its deal fell through (see related story, this page). The promise was part of the university's private contract and was made public only after a rival carrier obtained copies of the offer.

It was not clear if questions about the payment pledge contributed to the FCC's rejection of the tariff or if the commission will act on rival carriers' claims that such a payment violates provisions of the Communications Act.

In order to stay ahead, you have to think ahead.

That's what we've done for over 20 years. Nationally and internationally.

And we've led the field consistently over that long, two-decade race.

From statistical multiplexers in the '70s to networking T-1 systems in the '80s, Timeplex has been a leader in every aspect of wide area networking.

Now in 1990, Timeplex sets the pace again by introducing broadband, high-speed networking solutions to meet and support the growing needs and applications this decade will demand.

FDDI, T-3 and LAN-WAN internetworking can expand networks to even greater efficiency, flexibility and cost effectiveness.

Talk to the leader today.

Call Timeplex at (201) 930-4600 and ask for a copy of "Staying Ahead. Broadband Networking/ Connectivity for the '90s."

Our constant search for innovation, our problem-solving capabilities and our worldwide service and support make and keep us the global market leader.

The one the competition follows.

Timeplex®

The Connectivity Leader

See the FAXNeT Form on Page #108

Timeplex Corporate Headquarters
400 Chestnut Ridge Rd.
Woodcliff Lake, NJ 07675
(201) 930-4600

Timeplex Australia
Sydney
61/2/957/1660

Timeplex Canada
Ontario
(416) 886-6100

Timeplex Europe
Brussels
32/2/762/1696

Timeplex Far East
Hong Kong
852/833/6848

Timeplex Latin America
Woodcliff Lake, NJ
(201) 930-4666

Timeplex Ltd.
United Kingdom
44/753/43559

Timeplex New Zealand
Wellington
64/4/711/287

AT&T custom deals raise new concerns

continued from page 21

months. Claydesta Communications, a Midland, Texas, carrier competing for the university's business, made the clause public after obtaining copies of the offer.

MCI Communications Corp., which has repeatedly alleged that AT&T makes secret deals in the contracts, has renewed efforts to have the FCC examine the contracts.

In a letter to Richard Firestone, chief of the FCC Common Carrier Bureau, MCI said there is a "dire need for commission review of AT&T customer contracts." MCI complained that the payment pledge offered to the university is just another example of the type of possibly illegal promises AT&T is making to its customers.

Joaquin Gonzalez, vice-president of global networking strategies at the META Group, a consultancy in Westport, Conn., said the public disclosure of AT&T's contract promises might be enough to open the documents to FCC scrutiny.

"What that [University of Texas] contract does is rub the regulator's face in the fact that AT&T isn't playing by the rules," Gonzalez said. AT&T is testing the patience of regulators, and that could backfire, he said.

David Nall, counsel for the Independent Data Communications Manufacturers Association (IDCMA), agreed that the FCC might be prompted to review the contracts. "The whole question of contract pricing is one that the FCC hasn't given serious thought to," Nall said. "When you sanction pricing arrangements for particular customers that are arrived at by contract, there's a whole host of issues [about] the key terms and conditions of the contract and whether they are represented in what AT&T files with the commission."

IDCMA members have heard of several instances in which AT&T did not include all relevant information about the contract in the tariff, he said. For example, IDCMA believes that some of AT&T's Tariff 12 deals may have included discounts on equipment that were contingent upon customers purchasing regulated transmission service from AT&T. Such tie-ins are illegal, he said.

However, others dismiss MCI's allegations and say the disclosure of AT&T's payment guarantee for the University of Texas is unlikely to prompt the examination of other contracts.

"I do not see a connection between the Claydesta matter and Tariff 12," said James Blaszak, counsel for the Ad Hoc Telecommunications Users Group, many of whose members are Tariff 12 customers. "AT&T is clearly on the record as saying that the material terms and conditions associated with Tariff 12 offerings are in the tariff," not in hidden contractual clauses.

Blaszak acknowledged that users would be unhappy if their contracts were publicly disclosed. "Customers view the contracts as proprietary because they oftentimes have very detailed information about specific communications requirements and network configurations," he said. "That [information] would divulge much about a business's commercial operations and would certainly be valuable to a business's competitors."

Kenneth Phillips, vice-president of telecommunications policy at Citicorp, a Tariff 12 user, doubted the disclosure of AT&T's payment pledge would prompt the FCC to change its treatment of contracts. "The FCC has had the right to look at these contracts already; they're not secret," he said.

> "What that contract does is rub the regulator's face in the fact that AT&T isn't playing by the rules."
>
> ▲▲▲

Phillips, who also heads the Committee of Corporate Telecommunications Users, a group of the country's largest telecommunications customers, said he doesn't believe AT&T is making any illegal promises to customers.

And even if AT&T was making special offers in the contracts, "large users should be very leery," he said, "because much of it is unenforceable." If something in the public tariff contradicts language in the contract, the tariff takes precedence, he said.

Security reasons

"Because Citicorp is a financial institution, it's better that [network details] not be publicized because of fear of sabotage," Phillips said. "We'd rather not have people know where the POPs are that are supporting Sioux Falls [S.D.], which is the largest credit card data processing center in the world."

According to Gerald Brock, former chief of the FCC's Common Carrier Bureau and now a telecommunications consultant, the FCC was compelled by such arguments. The agency decided not to review custom network contracts, in large part to protect users' privacy.

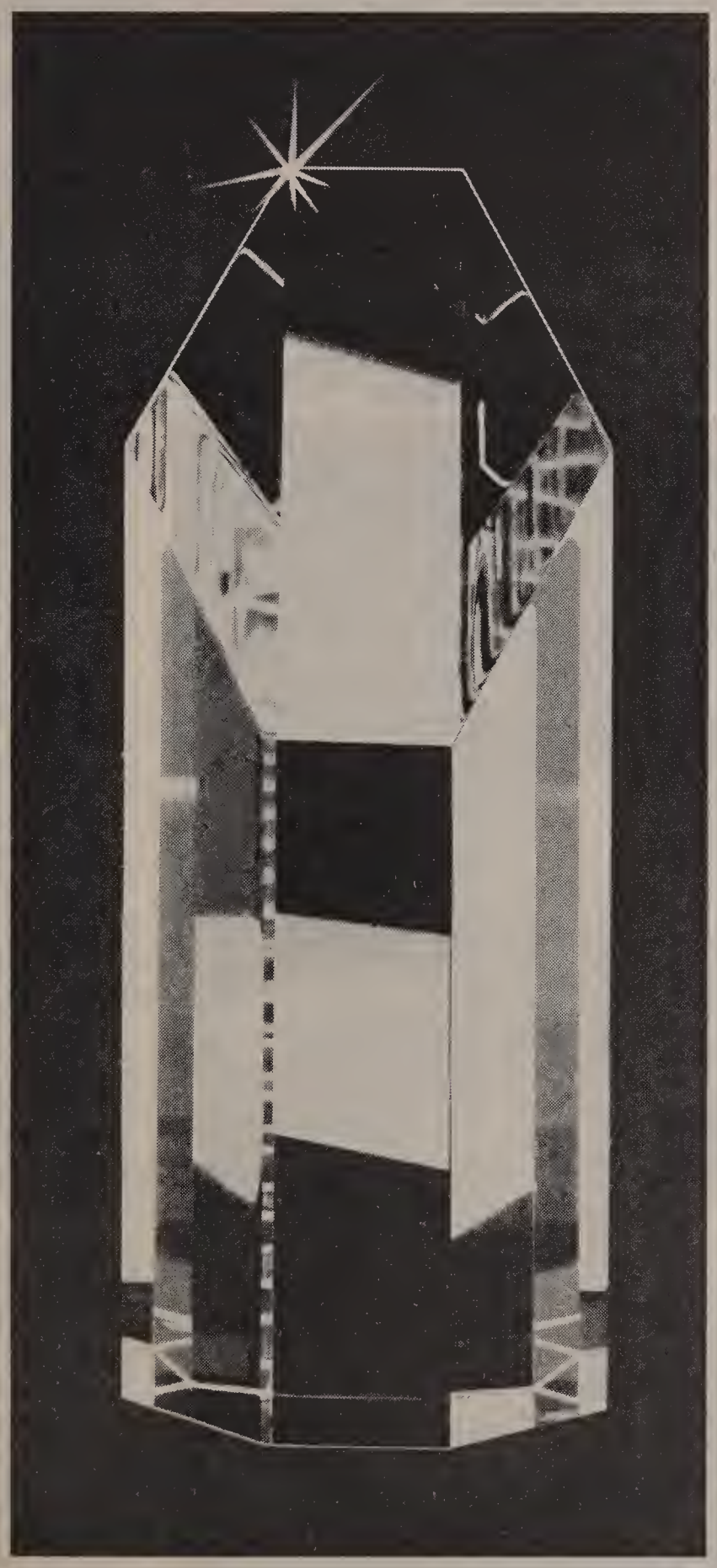
"Our concern was that [the contracts] do contain a good deal of proprietary information," Brock said. There is a strong likelihood that documents will become public once they're filed with the commission, he said.

He emphasized that just because the FCC hasn't reviewed any of the contracts doesn't mean the agency is giving up its oversight responsibility. The FCC has the authority at any time to examine the contracts, he said.

See the Action Center for networking products & services!

Use the Action Center Reader Service Card
and get free information
on networking products & services.

Announcing
The 1990 ENNE AWARDS
The Search Continues.



It's time to pay tribute to excellence. And excellence will be honored as the second annual ENNE awards program gets underway.

The ENNE sponsors – *Network World* and NetWorld – are searching

- For those companies using networking technology to their company's strategic advantage.
- For those companies finding exciting new ways to put those technologies to work.
- For those, in short, who exemplify best the spirit of enterprise networking.

If you've been successful in using enterprise networking to increase your bottom line, you're eligible for the ENNE Awards.

If you're an enterprise network user, supplier or enterprise integrator you may be a candidate for nomination. Call or write to ENNE Awards headquarters and we'll send you a nomination booklet.

In 1990, we will continue our search for the best of the best. And present the ENNEs – our industry's Mark of Excellence.

THE ENNE[SM] AWARDS
Honoring The Best Of The Best.

Call, or write for your ENNE Award nomination form today. And salute those who are defining tomorrow.

The ENNE Awards Program 305 Madison Avenue Suite 1424 New York, NY 10165
(212) 983-4965

Intel to use PBXs to switch video

continued from page 21

tions. Although Intel decided not to implement imaging after its 1987 trial, the company thought that the technology held promise for enhancing its voice teleconferencing system, which is used extensively for departmental staff meetings between employees at its seven major domestic sites.

Teleconferences, however, require distribution to participants via facsimile of agenda items and transparencies to be discussed, a cumbersome and time-consuming process.

"We left the equipment in for six months and decided we liked the idea of video but we didn't like that particular implementation enough to deploy it," Melvin said. "Also, the costs were fairly high."

Since then, performance of codecs has improved dramatically, and the price has decreased more than 50%.

In the 1987 trial between its Santa Clara and Folsom, Calif., sites, Intel used PictureTel Corp. C2000 codecs. Their picture quality was "right at the fringe of acceptability" at 192K bit/sec, Melvin explained. But Intel wanted codecs supporting a data rate of 128K bit/sec so the video transmission could be switched through its PBXs on two 64K bit/sec channels.

Another drawback was the C2000's price, which in 1987 was $75,000, PictureTel's Smith said.

The codec that will now be tested, the PictureTel C3000, costs only $30,000 and offers a two-to-one performance increase over its predecessor in terms of picture quality, Smith said.

New algorithm

That increase was achieved with a new algorithm running on the codec's Hierarchical Vector Quantization software.

The previous software program, Motion Compressed Transform, required twice the bandwidth to provide the same picture quality, Smith explained. Thus, a signal that was acceptable previously at 256K bit/sec would now be acceptable at 128K bit/sec.

Melvin said if the company decides to adopt videoconferencing, it will be implemented sometime in 1990. The company could decide to purchase codecs from PictureTel or another vendor, he said.

Carrier Watch

continued from page 21

M&SD Network Services works with MCI Communications Corp. and US Sprint Communications Co. to provide savings on domestic and international long-distance and private-line services.

In addition to call aggregation, M&SD Network Services contracts with telecommunications and data communications equipment vendors on behalf of ABN member companies.

ABN provides members with a choice of telephone switches and related equipment from companies such as Northern Telecom, Inc., NEC America, Inc., Rolm Systems, Inc., Mitel Corp. and Executone Systems Corp.

ABN provides members a choice of equipment from IBM, Apple Computer, Inc., Codex Corp., Black Box Corp., Control Data Corp. and General DataComm Industries, Inc.

ABN was established in 1983 to combine user buying power and to offer a competitive array of voice and data services.

ABN members include, Toys R Us, Inc., Ingersoll-Rand Co. and Time, Inc.

The Aries Group/MPSG, a Rockville, Md.-based consulting and tariff analysis firm, last week introduced an updated, expanded version of its *Master Glossary of Terminology for Business Communications Systems.*

The book, first published in 1972, contains nearly 2,000 entries pertaining to private branch exchange, key and hybrid telephone systems, as well as definitions of various calling services.

The guide's appendix defines 400 automatic call distributor terms.

The glossary is available immediately and costs $55. For more information, write to The Aries Group/MPSG at 1350 Piccard Drive, Suite 300, Rockville, Md. 20850, or call (301) 840-0800.

The Amdahl 4745 Lets You Make the Choice

NCP V3 NCP V4 NCP V5

Because different environments require different NCP™ releases--because you select a release based on your operating and fiscal needs, not on your vendors--you need, in a word, choice.

With the Amdahl 4745 Communications Processor, the choice is yours.

The 4745 allows you to switch between different levels of NCP within 5 minutes. So the migration process becomes a painless procedure--no additional hardware, no retraining, no disruption to your computer center.

And, the Amdahl 4745 out-performs other vendors by running substantially more medium and high-speed lines with industry-standard software.

The Amdahl 4745 Communications Processor..... choice and performance.

Amdahl Communications Products, 1250 East Arques Avenue, M/S 276,
Sunnyvale, CA 94088-3470
1-800-544-5376 (within California, 408-492-1077) Department 274

amdahl

20 years of excellence

NCP is a trademark of the International Business Machine Corporation.

See the FAXNeT Form on Page #108

Times change. Are your LAN connections outgrowing your budget?

You've started tying company LANs into an integrated network only to face the overwhelming demands of other departments that want to connect. While you could inflate your budget buying more hardware each time you add another LAN, with the ACS 4400 there's no need. With up to eight serial ports, a single ACS 4400 grows with your network.

Eliminate extra hardware without compromising reliability.

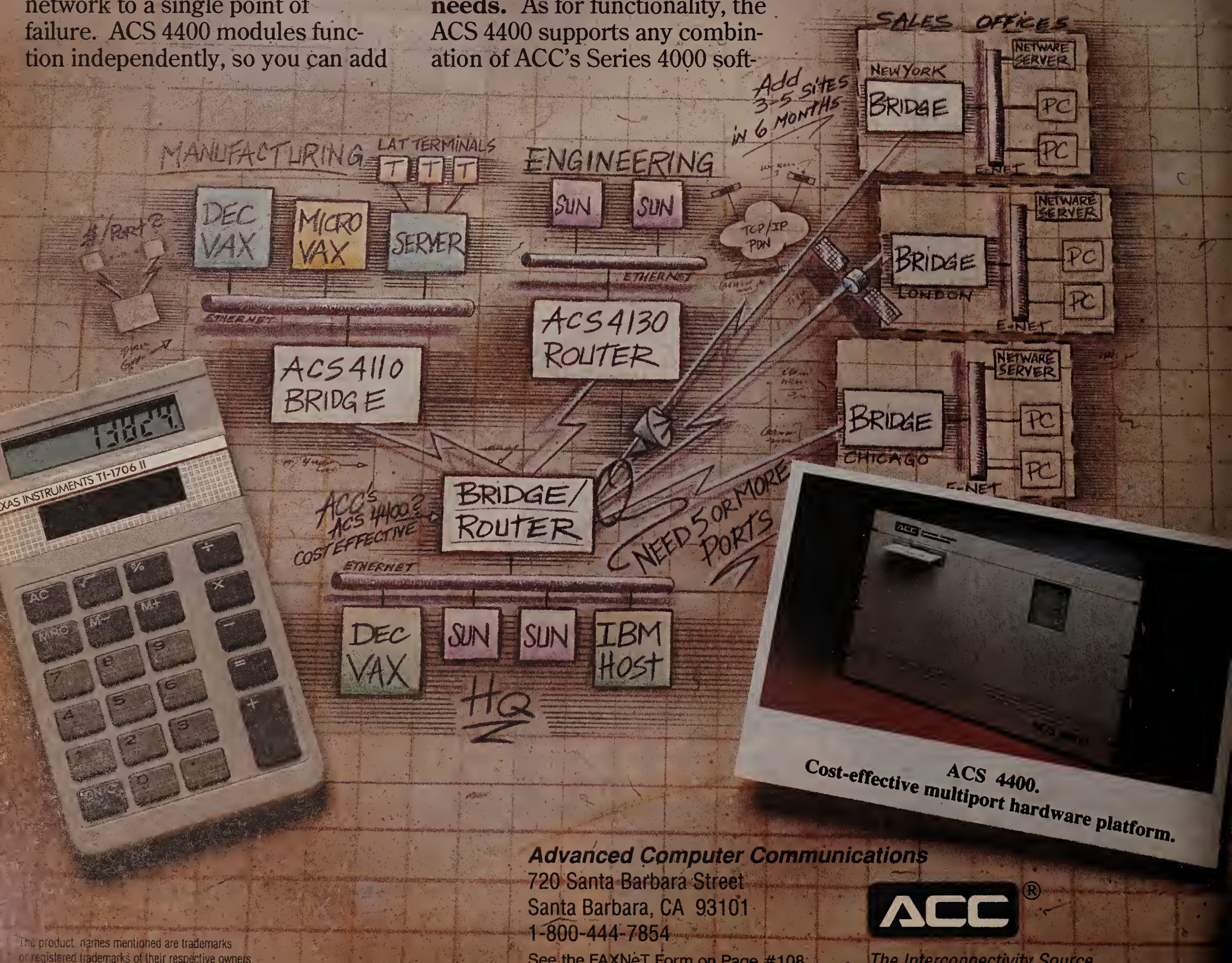
Cutting down on hardware doesn't mean reducing your network to a single point of failure. ACS 4400 modules function independently, so you can add or replace them individually without disabling the entire network.

Invest in the future by buying only what you need today.

While the ACS 4400 supports up to eight ports, you don't have to purchase them all at once. You can start with two or four and add more when new requirements arise. So while you spend only as much as your needs require, you also protect your investment by keeping expansion options open.

Tailor the ACS 4400 to fit your needs. As for functionality, the ACS 4400 supports any combination of ACC's Series 4000 software packages. Each ACS 4400 comes bundled with your choice of software. A single ACS 4400 supports bridging, routing, or combination bridge/routing all at the same time!

For additional information on the ACS 4400 and the entire ACS Series 4000 line of adaptable internetworking products, call ACC today at **1-800-444-7854.**



ACS 4400.
Cost-effective multiport hardware platform.

Advanced Computer Communications
720 Santa Barbara Street
Santa Barbara, CA 93101
1-800-444-7854

See the FAXNeT Form on Page #108

ACC®

The Interconnectivity Source

DATA COMMUNICATIONS

PRODUCTS, SERVICES, ARCHITECTURES, STANDARDS AND NETWORK MANAGEMENT

Worth Noting

"NetView/PC is sort of a wink and a nod in the direction of multivendor integrated network management. [IBM] users are still receptive to more comprehensive solutions."

Kevin O'Neill
Vice-president, networking research
Business Research Group
Newton, Mass.

Data Packets

BBN Communications Corp. this week is scheduled to announce a resale agreement with **Wellfleet Communications, Inc.** under which BBN will sell Wellfleet's line of multiprotocol routing bridges as the T/200 Internet Packet Routers. The T/200 marks BBN's first foray into the local-area network interconnect market. Traditionally, the firm has sold wide-area packet-switching products and integration services.

The company will position the T/200s as devices to link LANs to wide-area X.25 networks and as nodes that allow multiple LANs and X.25 nets to share the same backbone.

The T/200 is available now. Pricing ranges from $9,900 to over $80,000.

Larse Corp. this week is introducing at the Communications Network show in Washington, D.C. a new data service unit (DSU) that supports fractional T-1 services.

The Split-T Fractional T-1 DSU links two data terminal devices to a single T-1 line used to access fractional T-1 wide-area network services. The Split-T Fractional T-1 DSU supports varying speeds in increments of 56K or 64K bit/sec, as long as the aggregate data rate does not exceed 1.536K bit/sec.

The Split-T Fractional T-1 DSU costs between $3,495 and $4,500.

Bandwidth, costs hinder WAN imaging

By Tom Smith
New Products Editor

MIAMI — The bandwidth required for image transmission and its associated line costs pose major obstacles to extensive deployment of wide-area imaging networks, according to attendees at a recent imaging conference.

Transmission of images between remote locations offers many benefits to users — including reduced paper handling costs and faster access to data — in industries such as financial services, health care and manufacturing.

Despite the upside, wide-area imaging has only been implemented by a handful of users, according to leading vendors such as FileNet Corp., IBM and Wang Laboratories, Inc., mainly because the dial-up bandwidth needed is not available and leased line costs are prohibitive.

For users weighing wide-area imaging applications, the main issue is a trade-off between application requirements and the cost of dedicated high-speed digital lines, according to Michael Goulde, director of corporate information solutions at BIS CAP International, sponsor of The 1990 Image Management Systems Conference.

"Is the value of imaging great enough to warrant use of a [dedicated] T-1 or T-3?"

▲▲▲

"Is the value of imaging great enough to the user to warrant use of a [dedicated] T-1 or T-3 line?" Goulde asked.

According to Richard Kalin, manager of the image systems group for Digital Equipment Corp., users would have to generate enough traffic to keep such high-speed circuits in constant use to cost-justify wide-area image transmission. DEC was one of seven vendors that outlined product offerings for the 300 users and vendors in attendance.

Because the highest speed switched service currently available is 56K bit/sec, dial-up wide-area transmissions may not be practical for image-intensive users, said Marilyn Siderwicz, staff director-strategy integration at Nynex Corp. Siderwicz focused her presentation on multimedia communications, which includes imaging, as well as pictures, moving video and other media.

"That [56K bit/sec] is fine for voice, but it means you can only transmit thousands of bits of information per second, not the millions and millions that sophisticated users of imaging need," Siderwicz said.

Bob Castle, vice-president of marketing at FileNet in Costa Mesa, Calif., also described the cost of T-1 lines as a hindrance to the growth of distributed image processing.

As an example, Castle cited a hypothetical bank with multiple loan offices in a given region that needs to transmit image-based documentation between sites. "Putting a T-1 network together statewide to 60 branch offices can be an enormously expensive process," Castle said.

Possible solutions include the use of fractional T-1 services or the tariffing of dial-up T-1 so users have bandwidth on demand, according to David Sarna, chief executive officer of New York-based Image Business Systems Corp., a manufacturer of imaging software.

"Once those services become available, I think it will have a major impact on the technology," opening the door for more widespread implementation, Sarna said.

According to Walter Schoenleber, application support specialist in the state of Delaware's Division of Revenue, bandwidth and line costs are major problems for wide-area image transmission. "The cost will have to come down more before it's feasible," he said. In coming months, the Division of Revenue plans to issue a request for proposal for an imaging system to handle storage

(continued on page 30)

Pros and cons of imaging nets

PROS

- Reduces costs to store paper images.
- Reduces clerical staff needed to handle paper.
- Accessing stored images is quicker than retrieving paper copies.

CONS

- Image files ranging in size from 10K to 100K bytes require costly high-bandwidth circuits like T-1 and T-3.
- Less expensive switched digital services above 56K bit/sec are not available.
- Response times for image files are greater than for text files.

SOURCE: *NETWORK WORLD*
GRAPHIC BY SUSAN SLATER

X/Open net demo plays up portability

Demo underscores role of X/Open Portability Guide in developing client/server applications.

By Jim Brown
Senior Editor

WASHINGTON, D.C. — A group of 21 vendors recently demonstrated a distributed messaging application that complies with X/Open Co., Ltd.'s application development guidelines.

The demo underscored for users just how quickly they could port client/server applications across different Unix-based devices by using the X/Open Portability Guide.

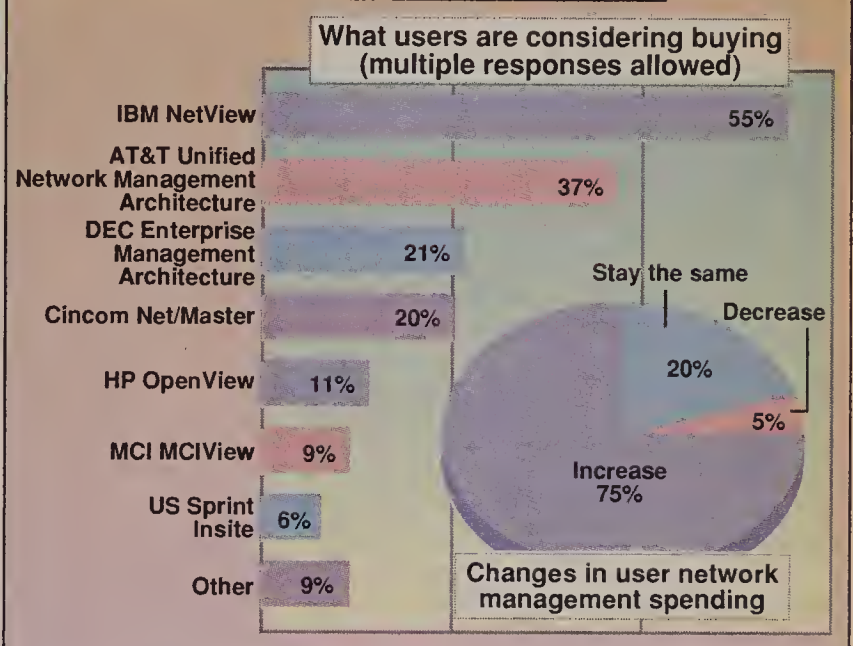
Sponsored by Uniforum and X/Open, the demonstration was conducted at Uniforum's recent Unix in the 90s show here.

For the demonstration, Uniforum hired a software consulting firm that used X/Open's guide to develop the Uniforum Conference Information System messaging application in just 2½ months. Traditional methods to develop the same applications could take six to nine months, said Van Weathers, marketing director for Uniforum.

"Part of what we wanted to show was that software written to conform to standards can be ported very quickly," said Ralph Barker, Uniforum's technical director. "I'd call 2½ months from

(continued on page 32)

Net control buying trends



Bar graph results are based on telephone interviews with 153 Fortune 1000 users who are actively planning to install an integrated net management system. Pie chart results are based on responses from 300 users.

GRAPHIC BY SUSAN SLATER — SOURCE: BUSINESS RESEARCH GROUP, NATICK, MASS.

Users planning to bulk up net management budgets

By Paul Desmond
Senior Writer

NEWTON, Mass. — Over 75% of Fortune 1,000 users participating in a recent survey said they are planning network management budget increases this year, according to Business Research Group (BRG), a research and consulting company based here.

The survey, based on telephone interviews with head network management officials at 300 companies, indicated that the average budget increase for net management will be nearly 50%. The report also found that many users have already committed to the integrated net management approach of their primary vendor, even if the vendor is a year or more away from delivering products.

In addition, the study concluded that AT&T and IBM are leading the charge for net management systems based on Open Systems Interconnection protocols, with Digital Equipment Corp. coming in third, 12 percentage points behind first-place AT&T.

Regarding network management budgets, 24% of the users indicated they intend to increase their budgets by up to 10% this year, the single largest category among those planning increases,

(continued on page 32)

Bandwidth, costs hinder WAN imaging

continued from page 29

and maintenance of tax returns.

Users, vendors and consultants have also expressed concern about response time for transmission of images, which can range from 10K to 100K bytes.

However, one high-profile user of IBM's ImagePlus system, United Services Automobile Association (USAA), is transmitting images from its home office in San Antonio, Texas, to four remote offices using a 256K channel on a T-1 line.

Local end users at USAA receive images within three to five seconds, whereas remote users can view images of the first page of customer files in about five to seven seconds, according to Charles Plesums, director of image systems at USAA.

Although other IBM users may be transmitting images over their wide-area networks, USAA is the only user IBM is aware of, according to David Liddell, manager of marketing plans, image application systems, U.S. Marketing & Services.

Murky image of WAN usage

Wang, which said it has over 400 image systems installed, has less than five customers transmitting images between locations, while between five and 10 are pilot-testing the capability.

FileNet's Castle said his company has about a dozen users transmitting images over wide-area networks, but he attributed that to the fact that FileNet has been selling imaging systems since 1985.

One user at a company that recently implemented an imaging system for check processing, The Huntington Service Co., the data processing arm of Huntington Bancshares, Inc. in Columbus, Ohio, said he is concerned about response time if it eventually transmits images of checks to other banks.

Huntington Service would have to transmit about 400,000 of the one million checks it processes daily, according to Thomas Hickey, manager of advanced technologies at the company, who was contacted prior to the show.

"Technically, we can send them out; but physically, I'm not sure we can get today's [checks] transmitted before tomorrow's are ready to go," Hickey said.

Users explore varied forms of net imaging

MIAMI — Two users attending a recent imaging conference here said the event gave them invaluable exposure to other imaging users, as well as to a bevy of imaging vendors and products.

Burlington Northern Railroad Co. and State Street Bank and Trust Co. are at different stages of evaluating imaging systems, but both companies had representatives at the conference to further explore the technology and to get advice from other users.

Burlington Northern Railroad embarked about a year ago on a pilot test of imaging using Wang Laboratories, Inc. equipment for input, storage and distribution of bills of lading, according to Ronald Wagenknecht, senior consultant for development support services and information systems services for the railroad company in St. Paul, Minn.

Burlington Northern Railroad is also considering pilot tests of two other imaging applications, which could be used for scanning correspondence related to labor claims processing, as well as improving storage of and access to engineering drawings.

Wagenknecht said he attended the conference for guidance in formulating an imaging policy.

"I'm really trying to come up with a corporate strategy," he said. That strategy would encompass issues such as whether to work with a single vendor or multiple vendors.

Wagenknecht said that "virtually every large railroad or trucking firm" is involved in some way with imaging, making it a competitive necessity for his company to develop a strategic plan.

Imaging has proven its worth in Burlington Northern Railroad's pilot test, he said, by improving access to bills of lading and allowing the company to distribute work loads more evenly. A decision on the Wang equipment is expected within two months, and a production system could be operational by late summer.

State Street Bank and Trust currently is not using or testing any imaging equipment, but it expects to issue a request for proposal for an imaging system in 1990, according to Peter Moran Jr., vice-president of the bank's Information Systems Division in Boston.

"Imaging technology has promise," Moran said. "The questions we have are how real is that promise and what can we do to capitalize [on it]?"

Moran said the bank is considering multiple imaging applications but has not decided on specific ones that could be implemented. He said imaging could help the bank improve productivity, cut costs and improve service to internal organizations, as well as customers.

Moran was also cognizant of competitive issues, saying he agreed with conference speakers' contention that companies that lag in imaging could fall as far as two years behind more proactive competitors.

— Tom Smith

Now Is No Time To Discover That Your Digital Network Doesn't Have Dial Back-Up.

Even the very best digital service is a bit of a gamble. Because none can guarantee 100% uptime.

So who can offer the digital solution that's closest to perfection?

ONLY GDC CAN.

Our new 500C family of DSU's is designed to take full advantage of the cost/performance benefits of digital service.

Consider our 500C/DBU. It incorporates a V.32 compliant Dial Back-Up unit for the ultimate in uptime and reliability.

It also enables you to gain the high performance of a private digital network and the flexibility of the analog public network with the same product.

The entire 500C family operates at multiple speeds; in synchronous or asynchronous modes. And all our DSU's are upgradeable for full network management, so your network won't ever become obsolete.

Further, GDC's exclusive DataCommonality allows you to mix and match analog and digital data sets (including intelligent T-1 CSU's) in the same space-saving racks.

But of course, you'd expect all this from GDC, the one broad-based vendor who not only fully understands the digital and analog marketplace, but also has installed more than 150,000 digital terminations.

Find out more. Contact GDC today and ask about our DataComm and Network Management versions of the 500C/DBU families.

Call Toll Free **1-800-777-4005**. Or (203) 574-1118. Fax: (203) 758-8507. Telex: 643357. General DataComm, Middlebury, CT 06762-1299.

ONLY GDC CAN

See Our Live ISDN Demonstration at Comnet '90, Feb. 6-8, Washington Convention Center, Booth 1138; Ramada Renaissance, Booth R-42

See the FAXNeT Form on Page #108

General DataComm

X/Open net demo plays up portability

continued from page 29

concept to delivery a pretty good product [development] cycle."

Major vendors taking part in the demonstration included Apple Computer, Inc., AT&T, Digital Equipment Corp., Hewlett-Packard Co., IBM, NCR Corp., Sun Microsystems, Inc. and Unisys Corp.

Designed solely for the show, the messaging application enabled attendees to use different vendors' Unix-based workstations to exchange messages as well as view special exhibitor notices and consult a schedule of special show events.

Uniforum chose to use a messaging system for the demonstration because it would support a function users at the show could utilize. By using the messaging system, users would then be able to see firsthand that applications developed with X/Open guidelines can be ported to different Unix-based workstations.

Now that it has proven that client/server applications developed according to X/Open guidelines can be easily ported to different workstations, Uniforum is encouraging users and vendors to adopt the guidelines.

At the core

The core software for the demonstration was developed for Uniforum by Crucible, a Santa Clara, Calif.-based software consulting and development firm. X/Open worked with Crucible to ensure that the application complied with guidelines in the X/Open Portability Guide Release 3.

The software consisted of a server component running on a Unix-based MIPS Computer Systems, Inc. server and a client portion running on various Unix-based workstations. Uniforum holds the rights to the software and has no plans to market the product to users.

The server component, developed last November, was designed to support basic message transfer functions. For instance, messages are stored in a data base as an ASCII file and are subsequently forwarded to the recipient when that user queries the data base to see if any messages are pending.

Client software — which each of the 21 vendors had to port to run on their respective Unix-based workstations — was delivered to them in December. The clients were linked to the server via an Ethernet local-area network running Transmission Control Protocol/Internet Protocol.

It's a hit!

Uniforum officials proclaimed the demonstration a success. Not only did vendors demonstrate that the client application could be ported to different Unix workstations, but attendees and Uniforum staff also used the system frequently.

Users lined up in front of workstations donated by AT&T and Network Computing Devices, Inc. located outside the show floor and meeting rooms. Each of the vendors in the demonstration also had at least one workstation running the client component in their booth.

Some users waiting in line to use a workstation were just curious to see what the workstations were being used for, while others were actually leaving messages for colleagues.

"We underestimated how often people would walk up to a terminal of this type and just use it," Weathers said.

See the FAXNeT Form on Page #108

Users plan to bulk up net mgmt. budgets

continued from page 29

according to Kevin O'Neill, vice-president of networking research at BRG. "But there was very significant representation in the higher categories, all the way up through increasing budgets by over 100%. So when you took the average [increase], it came out to 48%," he said.

Twenty-five percent of the users said they are planning no change or a decrease in their annual net management budget.

Almost none of the users said they currently have what they consider to be an integrated net management system, but 51% said they are planning to install one.

Of that 51%, 55% said they are considering IBM's NetView, 37% are considering AT&T's Unified Network Management Architecture, 21% are examining DEC's Enterprise Management Architecture and 20% are looking at Cincom Systems, Inc.'s Net/Master, which is the chief competitor to NetView for managing Systems Network Architecture nets. (Survey respondents were free to indicate more than one choice.) Other vendors' net management systems garnered 11% or less (see graphic, page 29).

"One of the key themes of the study is vendor dominance on an account and their effectiveness at convincing their customers that they have an integrated network management approach," O'Neill said. "That, to a large extent, accounts for why DEC — with no product out there and none to be out probably until next year — is having the impact it is."

When users were asked what vendors were perceived as most closely adhering to OSI for integrated network management, AT&T came out on top with 34%.

"IBM, largely on the basis of some of its positioning announcements, came in second at 31%," O'Neill said. "DEC was nearly 10 points behind at about 22% — which I think is remarkable, given DEC's stated intention with DECnet Phase V to be fully OSI-compatible."

O'Neill attributed IBM's high marks in the OSI arena to its positioning statements and its European OSI activities. IBM is said to be offering a number of OSI products that it has yet to announce in the U.S.

Worth Noting

"We couldn't live without the global naming facility in Banyan [Systems, Inc.'s] StreetTalk. It has put the world on the desktop. We don't have to worry about time zones or dictating telexes. Regardless of location, we can access network services and E-mail messages from any server on the network."

Eric Dickstein
Lead development analyst
Continental Grain Co.
New York

Netnotes

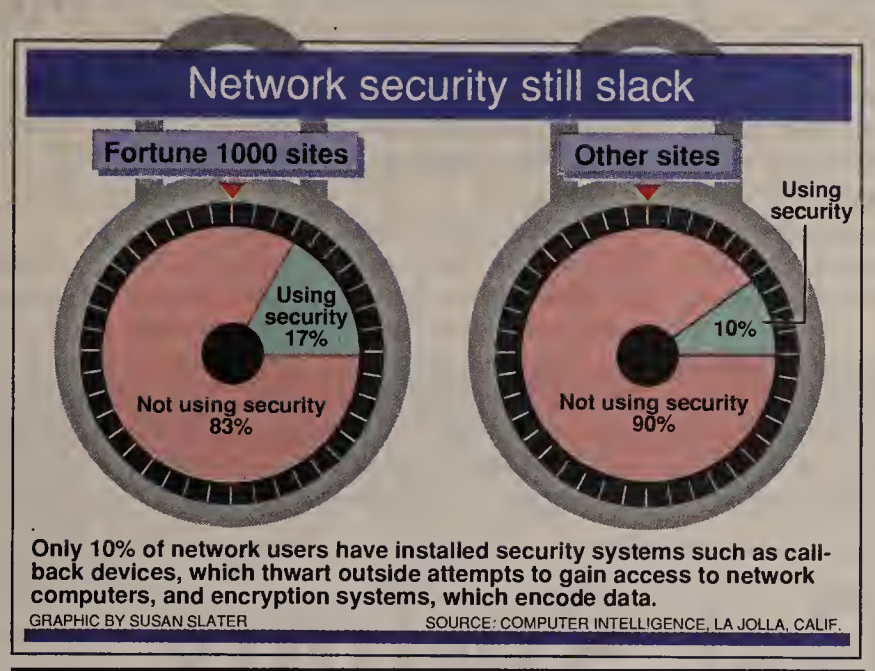
Unison Technologies, Inc. of Mission Viejo, Calif., this week is releasing a server-based software utility that helps provide power protection to local-area network users running Novell, Inc.'s NetWare 2.11 or higher.

Called Network Monitor, the software runs as a value-added process in the NetWare server and is designed to work with Unison's UniPower uninterruptible power supplies. The software eliminates the need for installing Novell's uninterruptible power supply monitoring card in the server. The only hardware required are the UniPower unit and Unison's interface cable, which attaches to the server's serial port.

In the event of a power failure or low-battery condition, the Network Monitor sends a warning message to all users on the LAN before initiating an unattended server shutdown. All server files are automatically stored to prevent data loss, and an error message is written to the NetWare error log.

Network Monitor is priced at $99.95 per server and requires 1M byte of memory. The units range in price from from $699 to $1,295, depend-

(continued on page 36)



Vendors back MHS, but user acceptance still uncertain

Flood of new products support the mechanism.

By Walter Sweet
West Coast Correspondent

SAN FRANCISCO — A growing number of software developers are following the lead of Novell, Inc. and bundling Action Technologies, Inc.'s Message Handling Service (MHS) into their products as a standard feature.

In recent months, a slew of business applications, electronic mail systems and facsimile gateways have been introduced that come with the store-and-forward communications mechanism. Novell bundles MHS into every copy of NetWare at no extra charge.

Unlike other messaging products, MHS allows users in an application to exchange messages and files with other MHS users on the same or different local-area network. Instead of exiting an application to generate a mail- or file-transfer routine, MHS users pull down an on-screen menu and communicate from within the program.

"Novell is distributing it free with all their LANs, but are all the customers using it?"

▲▲▲

Action Technologies' shipments of MHS have swelled of late due to alliances with such companies as WordPerfect Corp., Ashton-Tate Corp., Lotus Development Corp., Dayna Communications, Inc., cc:Mail, Inc. and, most importantly, Novell.

There are now more than 45 products that have incorporated MHS, said Tom White, Action Technologies' president.

White said he expects this number to increase in 1990. He said MHS, written for the DOS environment, may be embraced by the Unix, OS/2 and Apple Computer, Inc. Macintosh environments as well.

Industry observers generally liken MHS to X.400, but the latter has been slowly received by the LAN community, whereas part of the allure of MHS is that its broad acceptance simplifies the task of integrating different products. X.400, by contrast, is still being fine-tuned in the vendor community. The X.400 API Association, a group of vendors working on a common set of application program interfaces for X.400, is progressing slowly.

Will it last?

Despite the groundswell of support for MHS in developer circles, industry observers say they don't know how widely used MHS is and are uncertain of its future.

Nina Burns, principal of Network Marketing Solutions, a consulting firm in Menlo Park, Calif., said she thinks the number of people actually using MHS is relatively low, even though it may be bundled into their products. "Most LANs are fairly isolated, and if you're on the same server, you have less of a need for MHS because you don't have to go between servers," she said.

Don Fisher, vice-president of open systems marketing for Soft-Switch, Inc., which develops gateways linking disparate E-mail systems, questions whether users of MHS-capable products even take notice of the technology.

"Novell is distributing it free with all their LANs, but are all their customers using it? I would suggest that in the longer term,

(continued on page 36)

Global naming comes to the LAN forefront

Novell's introduction of naming services reflects user demand but lags behind Banyan offering.

By Laura DiDio
Senior Editor

Novell, Inc.'s announcement last week that it will provide global naming services for NetWare reflects the expanding need for facilities that help customers use and manage ever-growing local-area networks.

Until now, Banyan Systems, Inc. has been the only LAN vendor to offer global naming or directory services, a fact that has made the company's VINES network operating system popular among users with large enterprisewide networks.

But as general-purpose LANs have outgrown the confines of small work groups, other vendors have heard the call for global naming services. Last November, when Microsoft Corp. unveiled details of its forthcoming LAN Manager 2.0 product, directory services was one of the most prominent enhancements.

Global naming services — or directory services, as they are sometimes called — provide users with transparent access to all network resources, regardless of their location and the topology and size of the net, according to David Penzias, Banyan's manager of software product marketing.

The larger the network, the more important it is to have global naming.

"We couldn't live without global naming services," said Eric Dickstein, lead development analyst with Continental Grain Co. in New York. Dickstein's company, a longtime Banyan user, supports 1,000 users on about 50 networks in 200 offices worldwide.

"StreetTalk is an integral part of our everyday life," Dickstein said. "The minute you have to interconnect two nets, the StreetTalk facility within VINES makes interconnection a nonissue."

By far, the most sought after facility within global naming ser-

(continued on page 37)

DCA intros gateways for Macintosh, token-ring LANs

By Susan Breidenbach
West Coast Bureau Chief

SAN JOSE, Calif. — Microcomputer-to-mainframe pioneer Digital Communications Associates, Inc. last week introduced its first two gateway products for Apple Computer, Inc.'s Macintosh.

The gateways come in a Synchronous Data Link Control (SDLC) model for connecting Macintosh local-area networks to a remote mainframe, and an 802.2 version for providing mainframe links via a token-ring LAN. The latter is believed to be the first 802.2 gateway for the Macintosh environment.

Mac versions of Irmalan

The products are essentially Macintosh versions of DCA's 3-year-old Irmalan gateways, which let users of IBM-standard personal computers on a LAN share a single mainframe link. According to Peter Cheung, vice-president and general manager of DCA's Macintosh division, the difference is that the Network Basic I/O System interface in Irmalan has been replaced by a MacIrmaTalk driver that supports the physical- and link-layer AppleTalk protocols.

The MacIrmalan SDLC Gateway Server and the MacIrmalan 802.2 Gateway Server each support LocalTalk and token-ring LANs, providing Macintosh users with four new ways to attach to a mainframe. The gateway server

The products are essentially Macintosh versions of DCA's Irmalan gateways.

▲▲▲

software runs on a dedicated DOS-based personal computer attached to the Macintosh LAN by a LocalTalk or token-ring adapter. The SDLC version comes with one of DCA's SDLC boards, which are available for microcomputers based on IBM's Micro Channel Architecture or the industry-standard personal computer bus.

(continued on page 34)

DCA intros gateway for Macintosh LANs

continued from page 33

Each Macintosh sharing the gateway must run client software, an enhanced version of DCA's recently announced MacIrma workstation software, which enables mainframe-attached Macintoshes to operate in Distributed Function Terminal (DFT) mode.

DFT mode provides a Macintosh with up to five concurrent host sessions. These sessions can each support a separate application, or a single application can use multiple sessions.

API support

The server software supports the 2-year-old MacIrma product's application programming interface (API), so applications that were written for MacIrma can be used in a MacIrmalan environment.

According to Tom Lenahan, senior product manager for DCA's Macintosh division, the MacIrmalan gateway servers use only the AppleTalk protocols that operate beneath the network operating system level at the physical and link levels. Theoretically then, they should be compatible with any network operating system that supports Macintoshes on a LocalTalk or token-ring LAN.

To make sure the gateways work with at least two of the most popular network operating systems, DCA is testing them with Apple's AppleShare and Novell, Inc.'s NetWare for Macintosh, Lenahan said.

The initial MacIrmalan software works only over LocalTalk or token-ring networks, but Cheung said DCA will consider adding support of Ethernet in the second release if there is sufficient customer demand. Currently, the Ethernet-attached Macintoshes tend to be installed in environments dominated by Digital Equipment Corp. VAX computers, rather than by IBM mainframes.

The MacIrmalan SDLC Gateway Server, including an SDLC adapter, costs $4,495 for 16 concurrent users and $6,495 for 64 concurrent users. The 16-user MacIrmalan 802.2 Gateway Server costs $3,995, and the 64-user version costs $5,995.

DCA said users that buy either of the 16-user products can upgrade to the 64-user versions at a later date for $2,495.

See the FAXNeT Form on Page #108

Western Digital boards conform to 10BaseT spec

By Laura DiDio
Senior Editor

IRVINE, Calif. — Western Digital Corp. last week introduced two microcomputer Ethernet interfaces that conform to the IEEE 10BaseT Draft 9 specification for 10M bit/sec local-area networks that use unshielded twisted-pair wiring.

The company also cut the prices on four existing coaxial cable EtherCard interfaces by up to 20%.

The new adapters, called the EtherCard Plus 10T and the EtherCard Plus 10T/A, are among the first on the market that enable users to utilize existing twisted-pair wiring to transmit data across LANs at 10M bit/sec Ethernet speeds.

The EtherCard Plus 10T is designed for IBM Personal Computer XTs, ATs and compatibles. It features a standard 8K-byte random-access memory buffer and an optional 16K-, 32K- or 64K-byte boot read-only memory to load either Novell, Inc.'s NetWare or 3Com Corp.'s 3+Open network operating systems, said Bill Johnson, Western Digital's director of marketing for the microcomputer products group.

The EtherCard Plus 10T/A is designed for Micro Channel and compatible microcomputers. It features a 16K-byte dual-port buffer memory for high packet throughput, as well as the same boot ROM option for NetWare and 3+Open.

Western Digital has successfully conducted interoperability tests with its boards and 10BaseT-compliant wiring concentrators from Cabletron Systems, Inc., David Systems, Inc., Multi-Tech Systems, Inc., Networth, Inc. and Plexcom Corp., Johnson said. The adapters also interoperate with most AT&T Starlan 10-compatible concentrators.

Additionally, the new adapters are fully interoperable with Western Digital's earlier CardPlus adapters, which use coaxial cable.

Both of the new 10BaseT Ethernet adapters come with SuperDisk, a complete set of software drivers that enable the adapters to work with NetWare, 3+Open and the other major network operating systems.

The EtherCard Plus 10T costs $349, and the EtherCard Plus 10T/A is priced at $399. Both are available now. The prices are roughly equivalent to most other standard coaxial cable Ethernet adapters.

"Even at $349 and $399, our resellers will continue to enjoy an attractive profit margin," Johnson said. "Pricing the 10BaseT adapters this aggressively will be a big inducement to get users to buy them, and thus [will] accelerate the acceptance of 10BaseT products in the marketplace."

At the same time, Western Digital cut prices across the board for its existing coaxial EtherCard Plus cards from 13% to 20%.

The eight-bit EtherCard Plus and EtherCard Plus with boot ROM socket have been cut 13%, from $399 to $349, effective immediately.

The 16-bit EtherCard Plus 16 for Personal Computer XTs and ATs, and the EtherCard Plus/A for Micro Channel systems have been cut 20%, from $499 to $399.

Our New TCP/IP Terminal Server: More Performance. Less Money.

In just over one year, Emulex has shipped more than 7,000 terminal servers to DEC users worldwide. Now, the number one third-party vendor in the DEC marketplace brings the same advanced product technology to TCP/IP environments.

Our new Performance 4000-T Terminal Server is the optimum solution for UNIX users who insist on high performance. Fully TCP/IP compatible, the Performance 4000-T gives you a substantially lower cost-per-port, and one of the highest throughput rates available. It also gives you a high-speed parallel printer port.

And it's built for growth. A 16-line expansion module lets you expand the 12 and 16-line base models to 28 or 32 ports. Run 16 lines at 38.4 Kbps, or all 32 lines at 19.2 Kbps. *Simultaneously.*

The Performance 4000-T provides all the TCP/IP features you expect, in a surprisingly compact package! For more information, call Emulex toll free. It's one call to one company to handle multiple product needs.

EMULEX

Emulex Corporation, 3545 Harbor Blvd., Costa Mesa, CA 92626, (800) EMULEX-3 or (714) 662-5600 in California

North American Offices: Anaheim, CA (714) 385-1685; Dublin, CA (415) 829-1170; Roswell, GA (404) 587-3610; Burlington, MA (617) 229-8880; St. Louis, MO (314) 569-7792; Saddle Brook, NJ (201) 368-9400; Reston, VA (703) 264-0670; Schaumburg, IL (312) 605-0888; Canada (416) 673-1211

International Offices: Wokingham (44) 734-772929; Munich (49) 89-3608020; North Sydney (61) 2-957-1669; Paris (33) 134-65-9191

See the FAXNeT Form on Page #108

User acceptance still uncertain

continued from page 33

people won't be investing in MHS," he said.

Fisher said Soft-Switch hasn't seen much demand for MHS. His company has seen demand for personal computer LAN support, he said, but customers haven't been asking for MHS. Customers consider IBM's Systems Network Architecture Distribution Services (SNADS) a richer option than going with a protocol such as MHS, he said.

As the decade progresses, Fisher said he foresees two E-mail protocols — SNADS and TCP/IP's Simple Mail Transfer Protocol — coexisting with OSI's emerging X.400 store-and-forward standard.

"That's not to say MHS won't be around for a long time," he said. "MHS may survive, and MHS may not survive." Fisher said. "But how many E-mail protocols do we need?"

Action Technologies' White agrees that X.400's success is assured, but he contends that MHS complements, rather than competes, with it. He said X.400 was built for system-to-system connectivity, while MHS was developed for application-to-application messaging.

"I believe that X.400 and MHS are compatible," White said. "I'm not going to be so parochial as to say that MHS is the only answer. There are people who think the world is made up of standards, but what is a standard about? I think the standard is validated by users, not by vendors."

The challenge Action Technologies and its MHS licensees now face, White said, is getting users to take note of the MHS capability in the products they have or plan to buy.

White said Computerland Corp., one of the world's largest chains of computer stores, is one company that has already tapped the potential of MHS.

Computerland uses MHS to enable its traditional accounting operations and store management, point-of-sale and order-entry systems to communicate. Computerland had started to write its own communications package to provide the necessary links before deciding that MHS would fit the bill.

If volume alone were enough to assure the ultimate success of MHS, the future of the product would be guaranteed. According to White, MHS shipments nearly doubled in 1989, making MHS available to about 750,000 potential users.

White predicts that shipments will grow at least as fast in 1990 and that MHS will be in the hands of up to two million potential users by the end of the year.

Netnotes

continued from page 33

ing on capacity, and the Novell Interface Cable costs $55.

Unison Technologies can be contacted at 23456 Madero, Mission Viejo, Calif. 92691; (714) 855-8700.

Business Systems Group, Inc. of Houston last month published *NetWare Supervisor's Guide,* a 500-page reference volume for network supervisors, administrators, installers and consultants who work with Novell, Inc.'s NetWare network operating system.

According to the publisher, the book includes installation tips for typical applications, covers undocumented commands and utilities, and discusses the implementation of system fault-tolerant local-area networks.

The book's primary author is John McCann, the lead system operator for Novell's NetWare user forum. One of the coauthors is Adam Ruef, a senior supervisor in Mobil Chemicals Co.'s application development and office automation division and a founding member of both the International NetWare User's Group and the Association of NetWare Users. The other is Steve Guengerich, director of publishing for Business Systems Group and editor-in-chief of the "NetWare Advisor" monthly newsletter.

The book is priced at $29.95, which includes shipping and handling. Business Systems Group is located at 24 Greenway Plaza, Suite 1305, Houston, Texas 77046; (800) 950-5267.

Global naming comes to the LAN forefront

continued from page 33

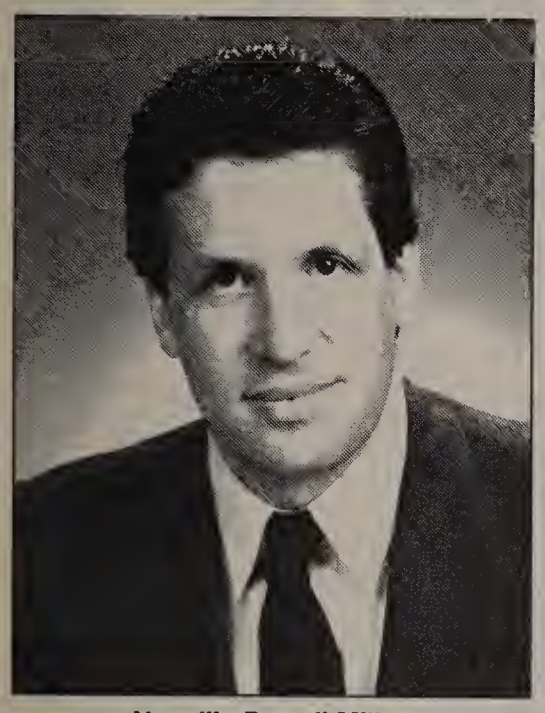
vices is remote user logon. The feature enables users to log onto a network from any location and access all network servers and services. By comparison, most LAN users today — except Banyan's installed base — must log on to each server.

"We didn't know how important the StreetTalk global naming facility was until we started to use it," Dickstein said. "StreetTalk removed the need for us to know where a particular print or file service and corporate data base was located. StreetTalk has enabled our office in [West] Germany to access the printer in our Geneva office every day."

Global naming services also make life easier for system administrators by enabling them to set user parameters — such as access rights, logons and passwords — just once. In the absence of global naming services, administrators have to establish logon procedures for each remote device.

With all of the advantages, why has Banyan been the only vendor to offer a global naming service? Many users haven't required it. The typical LAN is still a departmental work group of 12 nodes or less, all of which are located in the same office. But that's changing.

"Global naming or directory services are becoming more of a necessity now be-



Novell's Darrell Miller

cause networks are growing so fast," said Richard McAniff, Microsoft's senior group program manager for LAN Manager. "As networks grow and become interconnected to other LANs over a wide area, the ability to manage the entire enterprise network dictates that the user has a strong directory service facility," he added.

Initially, Novell, Microsoft and its OEMs will offer basic global naming or directory services and not the full spectrum of features currently available in Banyan's VINES StreetTalk.

Darrell Miller, executive vice-president of Novell's Software Products group, said the firm's customers identified global naming as the company's No. 1 priority last May. "We were taken aback at how emphatic they were. They basically told us: 'Give us some sort of global naming capability now; we don't care how lean or mean it is,' " he said. "So we drafted a scheme that's based on international standards. We'll phase in various capabilities and functionalities over a two-year period."

Novell's initial product release will be sold as a separate NetWare Loadable Module, rather than being integrated directly into the network operating system as Banyan does with the StreetTalk facility in VINES. The forthcoming Novell offering will give users fundamental global naming capabilities such as remote user logon.

"The remote user logon accounts for only 20% of Novell's overall plan but accomplishes 80% of what users are currently looking for in a global naming service," Miller said.

Mike Murray, business director for Microsoft's networking group, claimed Microsoft will offer a "full suite of directory service functionality" in LAN Manager 2.0, which is due to ship to OEMs this quarter.

Although Murray declined to confirm it, sources within Microsoft said the company has built its directory services into the core of the LAN Manager net operating system.

"Microsoft will package its directory service in much the same way as Banyan packages StreetTalk [but] won't sell it separately as Novell plans to do," the source said.

Microsoft's approach to directory services differs from Novell's in that it will enable network administrators to establish groups of servers, called server domains. Users can then access any server or service within a particular domain as though it was a single server, explains McAniff.

"Our directory services will enable all remote resource requests to be mapped through the directory server, so that the user in a particular domain sees only a single system image," McAniff said.

Microsoft is also including an interface that will provide users with complete search and browse capabilities, subject to individual access privileges, McAniff said. And like Novell and Banyan, Microsoft plans to support the X.500 Naming Conventions, he added.

But both Novell and Microsoft still have a lot of catching up to do before they're able to offer their users the level of global naming functionality that Banyan's StreetTalk has offered for the past five years.

StreetTalk, for example, currently allows users to access gateway services, mail systems, print queues, fax gateways and host gateways with a single password, Penzias said. By contrast, Novell and Microsoft's initial global naming services will require users to have a different password for each service and function; network administrators must also maintain the various passwords in a secure fashion.

Gandalf Hybrid Networks Make Compatibility a Reality.

In today's sophisticated information processing and communications environment, you need a network that can integrate your existing computing resources into a single, cohesive, cost-effective, transparent system.

You need a network that can distribute all of your information to those who need and are authorized to use it, regardless of vendor or communications protocol. You need a Gandalf Hybrid Network.

With a Gandalf Hybrid Network, you can extend your existing investment in computers, increase the productivity of your people, and take advantage of tomorrow's technologies and standards.

Find out how Gandalf can make compatibility a reality in your networking environment. Call Gandalf, first in Hybrid Networks: ***1-800-GANDALF.***

Canada: 613-723-6500, UK: 0344 860272, Europe: 31 20 867611, France: 33 1 4760 0032, Australia: 61 2 437 5977

gandalf

Bridging Islands Of Excellence

See the FAXNeT Form on Page #108

Dialogue

Has AT&T's recent nationwide network outage caused you to question the ability of carriers to provide reliable service?

"It shows carriers are human. If you track their performance over the years, the outage is an anomaly, a small blip on their record.

"But it also shows that software is becoming a more critical part of a network, and this concerns me. A person can write a line of code to upgrade a program and unknowingly cause a widespread disruption on the network."

Dennis Murphy
Director of telecommunications
Warner Communications, Inc.
New York

"There have been a number of events over the past few years, such as the Hinsdale [Ill.] fire and now the AT&T outage, that have shaken the confidence of users. These events really drive home how vulnerable businesses are to carrier outages.

"Many users are exploring multicarrier arrangements and reevaluating their disaster recovery plans to make sure they have adequate safeguards against a major outage."

Charles Steinfield
Associate professor of telecommunications
Michigan State University
East Lansing

"Absolutely not. The network is bound to break sometime. Even though this was a software-related problem, the carriers all have a pretty good track record.

"That doesn't mean you should put all you're eggs in one basket. You have to plan ahead so that when such breakdowns happen, you're covered."

Steve Wood
Telecommunications manager
Hambrecht & Quist, Inc.
San Francisco

"Not really. AT&T handled the outage really well and took appropriate steps and actions to ensure that the same thing won't happen again. That type of problem could have hit any of the carriers. It won't cause users to shift traffic to multiple carriers."

Gus Bender
Second vice-president of telecommunications
The Travelers Corp.
Hartford, Conn.

Users tone up with cross-training plans

Companies give network employees chance to expand expertise in a range of technical fields.

By Wayne Eckerson
Senior Writer

For a lot of people, cross-training conjures up television ads for Nike sneakers and the athletic versatility of sports superstar Bo Jackson.

But many companies are using cross-training to broaden the knowledge and skills of network professionals who are faced with increasingly complex and technologically diverse network environments.

While companies aren't looking to groom Bo Jackson look-alikes, they are eager to develop employees who are competent in a number of technical areas and who have a better sense of how disparate technologies can be combined in new and innovative ways to meet users' applications needs.

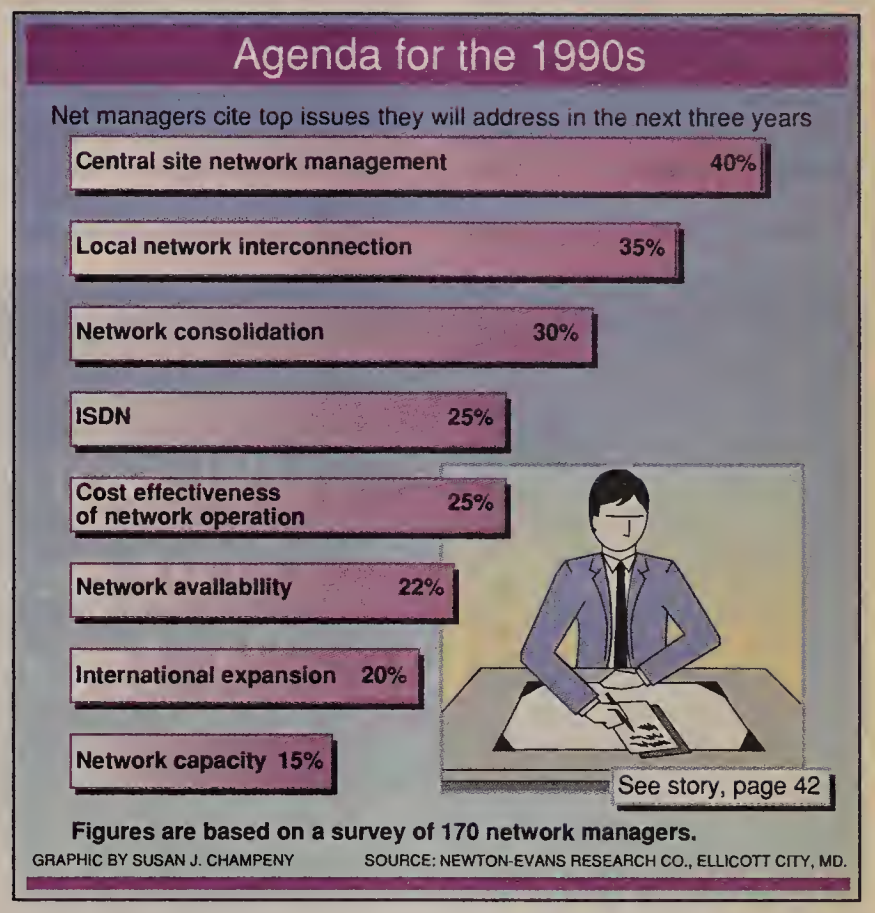
Although methods vary from company to company, cross-training usually involves assigning workers to projects outside their areas of expertise. Workers are receptive to cross-training because it enhances their marketability as job candidates and gives them the experience needed to advance into management positions.

"We've had some excellent paybacks with cross-training," said George Tabback, director of information systems at Ingersoll-Rand Co., a machine and tool manufacturer based in Woodcliff, N.J.

Tabback said he recently assigned a software developer to the network department even though many questioned the move because the person had no previous network experience. However, the person quickly learned the basics of network operations and drew on his software experience to automate many routine network functions such as changing telephone numbers, Tabback said.

In addition, the employee is more comfortable dealing with new software-based services, such as virtual nets, than other

(continued on page 40)



GUIDELINES

Unsolicited callers cause anxiety for net managers

One of the more annoying aspects of a network manager's job is dealing with the daily barrage of phone calls from salespeople and survey-takers.

Managers interviewed by *Network World* said they average between 30 and 50 unsolicited calls a week. They characterized most of these calls as "aggravating;" some, they said, are even "infuriating."

Greg Crosbie, director of technical operations for the *Journal of Commerce,* said cold-calling telemarketers are the worst.

"Most salespeople eventually get the message you aren't interested in their product," Crosbie said. "But some telemarketers keep calling week after week, no matter what you tell them, because they are cold-calling from lists that are never updated."

Crosbie said he had to write a threatening letter to the management of one telemarketing firm which called him every other week for two years. "They drove me crazy," he said.

Steve Wood, telecommunications manager at Hambrecht & Quist, Inc., an investment banking firm in San Francisco, said survey calls bother him the most. Wood said he gets more calls from people conducting surveys than from salespeople.

"You know that whatever questions they ask, their ulterior motive is to sell you something," he said.

Just say no

While network managers can do little to prevent unsolicited calls, many have devised techniques to deal with callers once

(continued on page 40)

Drexel builds T-1 network to support new enterprises

Brokerage firm sells net capacity, DP services.

By Wayne Eckerson
Senior Writer

NEW YORK — Drexel Burnham Lambert, Inc. is venturing into new network territory.

The financial services company, based here, recently began marketing network capacity and data processing services to other users. To help support the endeavor, Drexel Burnham Lambert is building a new T-1 backbone network that will consolidate voice and data traffic between its major hubs.

The initiatives are expected to reduce the company's network outlays by about $5.5 million a year and reflect Drexel Burnham Lambert's zealous commitment to cutting costs and reducing operating expenses.

"If we take in more work and save our nickels and dimes, we will continue to reduce operating expenses," said Gerald Higgins, senior vice-president of data processing and communications.

In addition to selling processing time on its mainframe computers and capacity on its network, as well as marketing a wide range of technical consulting services, the company is offering its proprietary securities processing software to other financial services companies.

More with less

Cost cutting is not new to Drexel Burnham Lambert. Since 1986, the company has slashed its total information system expenditures from $160 million to $78 million. More than $60 million of the savings came from reductions in communications expenditures ("Drexel sees cost cutting as a virtue," *NW,* Feb. 6, 1988). "We take cost cutting seriously here," Higgins said. "Our motto is 'Do more with less.' "

Drexel Burnham Lambert's new network, dubbed Wideband Integrated Network (WIN), will save money by combining data, private-line voice and switched voice traffic onto a T-1 backbone linking its major offices in Beverly Hills, Calif., Chicago and New York.

Currently, Drexel Burnham Lambert's backbone data net consists of AT&T 56K bit/sec Digital Dataphone Service between its three major nodes and low-speed digital or analog lines to a dozen smaller locations. The three major nodes house Timeplex, Inc. Link/1 multiplexers for routing data traffic.

Voice communications are split between voice-grade private lines and MCI Communications Corp.'s Vnet virtual network switched service.

Last summer, Drexel Burnham Lambert awarded AT&T a contract to convert its entire data net to digital services and upgrade existing 56K bit/sec circuits to T-1 lines. The company is also replacing its Timeplex Link/1 multiplexers with Link/2 units, which will allow the network to handle both voice and data traffic.

Drexel Burnham Lambert's regional offices will be connected to the backbone via 19.2K bit/sec or 56K bit/sec digital lines.

Once the network is in place

(continued on page 42)

Users tone up with cross-training

continued from page 39

members of the department who have had little exposure to software, Tabback said.

"As networks become more dependent on software, it makes sense to bring these two areas of expertise together," Tabback said.

Many companies have discovered that exposing network employees to different areas of expertise through cross-training adds flexibility and depth to the information systems group.

Cross-training builds up a reservoir of knowledge in multiple areas so that companies aren't stranded when key specialists resign, according to Eric Schmall, a network systems manager for a large insurance holding company.

In addition, cross-training is becoming a requirement to work with many new network applications that combine once distinct technologies, such as voice and data, Schmall said.

"You need to encourage cross-pollination among your staff because network technologies are coming together," Schmall said. "It's best to have a person who can understand both sides of an equation."

Schmall said his division is in the process of redrafting network job descriptions and career pathways to encourage people to gain expertise in several areas instead of just one.

To move up the job ladder, employees need to be experts in one area and have a working knowledge in several others, Schmall said. Staffers can increase the breadth and depth of their knowledge by volunteering for projects in any number of areas, including local nets, voice response, image, video, very small aperture terminals and voice messaging.

Schmall admitted that initially cross-training might hurt the department's productivity because it takes people time to become familiar with new technologies. However, he said the learning curve for most staffers would be relatively short.

Some companies prefer that employees broaden their expertise by attending educational seminars and conferences rather than learning on the job.

> "It's difficult to switch somebody to another area when there's a lot of work."
>
> ▲▲▲

"It's difficult to switch somebody to another area when there's already a lot of work to do," said Jerald Marcone, assistant vice-president of telecommunications at Crum & Forster Corp., an insurance company in Morristown, N.J. "Cross-training might be a good idea, but you can't afford to hurt the operation."

Marcone said that encouraging people to attend seminars is a low-risk way to give people exposure to different areas.

Callers cause anxiety

continued from page 39

they're on the line.

Crosbie says he asks salespeople to send him a brochure on the product they're selling so he can add it to a vertical file. "That seems to satisfy them and makes the calls short," he said.

Wood tries to establish a positive rapport with vendors so they know he'll call them when he's ready to buy. "Some vendors have learned that they don't have to call all the time to keep our business."

But Wood admits that sometimes it's hard not to be rude when a salesperson starts reading a canned speech that lasts for five minutes.

"I used to be a salesman myself, but sometimes you just have to cut them short," he said.

While unsolicited calls can add stress to an already hectic day, they're a cross all network managers have to bear. To be productive, a manager has to find a simple, but firm way to deal with such unwanted interruptions.

IDC WHITE PAPER

ISDN—Integrated Services Digital Network

INTEGRATED SERVICES DIGITAL NETWORK

AN IDC WHITE PAPER FOR INFORMATION SYSTEMS MANAGEMENT

Welcome to the Real World.

Real-World ISDN.

As an idea, ISDN technology ranks right up there with sliced bread. But what can it do for you in the real world? The U.S. Army's strategic research and development facility at Redstone Arsenal found the answer at their local phone company. South Central Bell showed them how to enlist ISDN technology to help them perform their crucial communications tasks.

South Central Bell and the U.S. Army

Faster. More efficiently. Using the AT&T Network Systems 5ESS® Switch. Now, guided by ISDN technology, Army researchers and engineers can use a single telephone line to deploy simultaneous voice and data transactions. At speeds up to 64Kbs. A mission that used to require special conditioned private lines can now be accomplished on ordinary telephone lines over the public switched network. Call your local telephone company marketing representative to find out how ISDN technology can help you win in the real world.

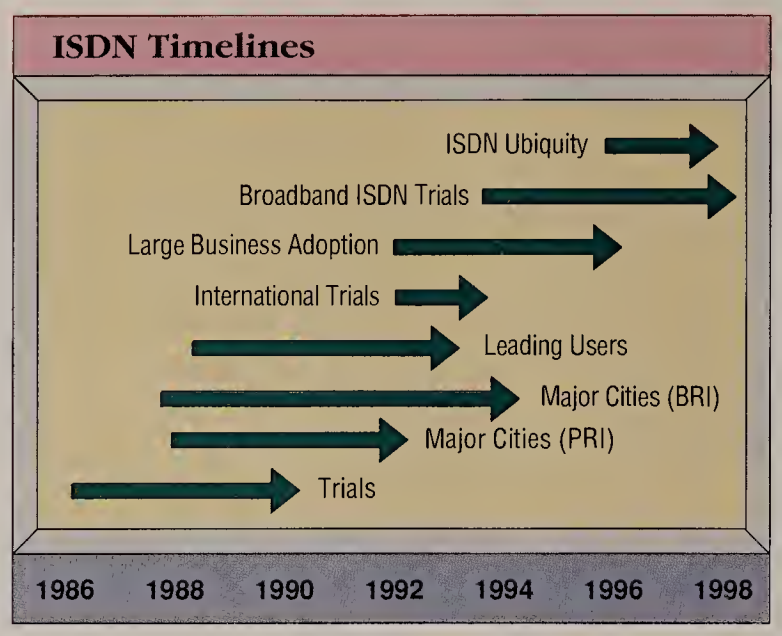
AT&T
Network Systems

ISDN

THE INTERNATIONAL TELECOMMUNICATIONS UNION (ITU), DEFINED ISDN IN 1981 AS: "A NETWORK EVOLVED FROM THE TELEPHONY INTEGRATED DIGITAL NETWORK THAT PROVIDES END-TO-END CONNECTIVITY TO SUPPORT A WIDE RANGE OF SERVICES, INCLUDING VOICE AND NON-VOICE SERVICES, TO WHICH USERS HAVE ACCESS BY A LIMITED SET OF STANDARD MULTIPURPOSE CUSTOMER INTERFACES." ■ THE BENEFITS OF ISDN ARE DELIVERED TO THREE DISTINCT GROUPS. THE TELECOMMUNICATIONS COMPANIES OF THE WORLD (I.E., THE PHONE COMPANIES) BENEFIT BY IMPLEMENTING MORE COST-EFFECTIVE TECHNOLOGY, BROADENING THEIR USER BASE, AND ENHANCING THEIR SERVICE OFFERINGS.

The computer and communications equipment suppliers of the world (i.e., IBM, Digital Equipment Corp., Northern Telecom, Inc., Timeplex, Inc., and Codex Corp.) benefit by the increased demand for network-oriented processing systems as a result of expanded services and markets. And last, and even most importantly, end users (i.e., you and I) benefit by having access to simple-to-use, relatively high-speed, highly reliable, globally available, and competitively priced voice/data/video information services.

The following research paper is meant to provide a general overview and status report of the progress of ISDN. It is not meant to be a technical journal, nor is it composed of ISDN hype. Instead, it paints a realistic, yet hopeful, picture of the next big step in the evolution of the public and private networks around the world.



EVOLUTION OF ISDN

History of ISDN. ISDN as a technology standard has its roots back in the late 70s. It was at this time that AT&T set about the business of integrating different information streams, building toward distributed processing, and redesigning and reimplementing its mostly analog network into a totally digital transmission scheme.

In 1980, while AT&T was preparing for the inevitably more demanding customer base, the worldwide telephony community formed under the banner of CCITT to establish a set of standards for a universal Integrated Services Digital Network. ISDN was born. AT&T in the post-divestiture world let go of the defacto standards setting activity for this country and it was promptly reformed under ANSI and its T1D1 organization.

The standards setting activities were mostly completed in the early to mid-80s with trials starting up in 1986. Needless to say, the progress has been slow, and as a result, many of the initial reasons for an ISDN, such as digital transmission, high-speed end user connectivity, and distributed processing, have been supplanted by other technologies such as local area networks, fiber transmission facilities, private T-1 networks, and high-performance workstations. This is not to say that ISDN has no place in the world as we know it today. It definitely does. If the reason for all networks is timely information access, then ISDN in many ways represents the networking alternative with the broadest potential reach. It may not be the fastest, or the most feature-rich, but it represents the most all-encompassing network of the future.

Why ISDN? ISDN was designed to provide a worldwide mechanism for delivering standardized telecommunications services not just among the world's telephone companies, but also among the world's end-users. The telephone companies of the world are not usually accused of being far-sighted, but they readily accepted that the world was increasingly asking for more than just voice-oriented analog switching. This multi-billion dollar business, although a huge revenue generator, exists within a fairly flat and increasingly competitive market.

Salvation for the telephone companies comes in the form of digital transmission services, the management and movement of voice, data, and video information, and highly profitable value-added services, such as advanced call handling capabilities, mail delivery, videotex, and public data base access. Remember, in the late 70s, the computer and software companies of the world were reaping the benefits of servicing the information-intense environment that would no doubt be present the rest of this century and beyond. The telephone companies wanted a piece of this action. And given the size of most phone companies, only a large piece would be adequate. This could only be accomplished by implementing a large and very powerful network which could then be leveraged into the workplaces and hearts of governments, commercial entities, and end-users of the entire world. Granted it was an aggressive plan, but a boundless profit potential was riding on ISDN's future success. And since the phone companies form the core of ISDN transport and services, those phone companies that implement the most effective, efficient, and timely ISDN capabilities are guaranteed a large return over the next five, 10, and 20 years. This is especially true in today's increasingly standardized and deregulated telecommunications industry.

DEFINITIONS

The ISDN Network Node. Because of the breadth of service ISDN provides, a node could be just about any type of information processing device. PBXs, computers, PCs, workstations, video codecs, terminals, telephone handsets, fax machines, and central

Southwestern Bell is sharing, not secluding ISDN technology

Somehow, this seems too good to be true. In a world where the fruits of technology development are typically guarded like proprietary treasure, Southwestern Bell's Advanced Technology Laboratory here has brought users and vendors together in an environment where the latest technology is shared, not secluded.

Although the central focus of the lab is Integrated Services Digital Network (ISDN), it plays host to an array of additional technologies that are tested under conditions that don't threaten live service offerings. Everything from videotex to fiber optic multiplexers to remote file sharing is under investigation. And the charge for access to the Advanced Technology lab is zero, nothing.

The price must be right. Since the lab opened in mid-1987, a throng of users and vendors from around the world have come to test and develop products in a real world environment they wouldn't otherwise have access to. Users have the opportunity to put their hands on complex, expensive equipment before they make any big dollar commitments to altering their networks. Vendors can test their equipment against central office switches and computers from a variety of other vendors.

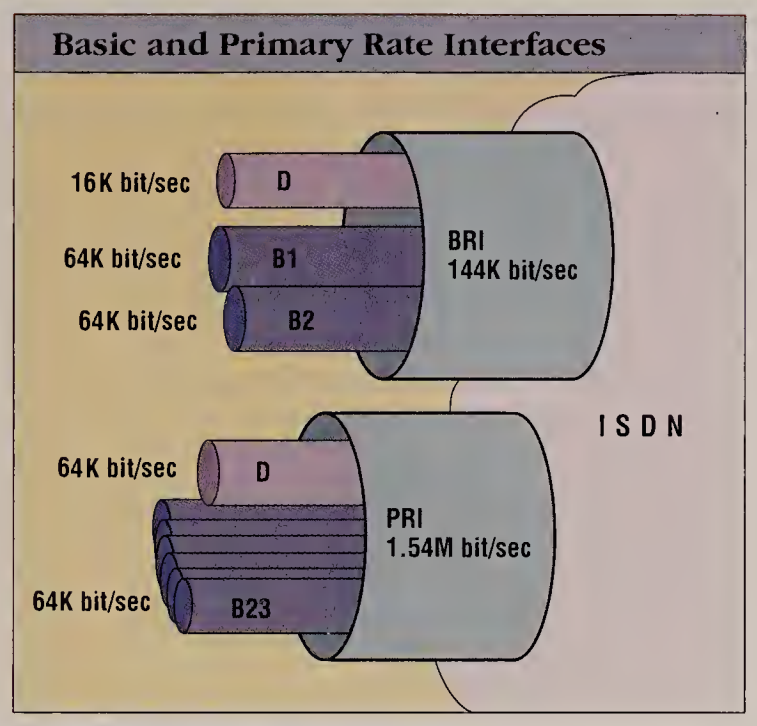
office switches are all candidates. The key to ISDN in the near future is making all these devices work together in a coherent and worthwhile fashion.

Here, ISDN's role as integrator of disparate systems, not enabler of new services, is one that is sometimes lost in the glamour and hype surrounding this new worldwide technology. It is this systems integrator role that has attracted most early paying customers to ISDN.

Basic vs. Primary Rate Interface. Basic Rate Interface (BRI) defines three separate channels for use by the subscriber. These channels combine over one physical connection to provide a 144K bit/sec pipe into the ISDN. This pipe is divided into two 64K bit/sec B channels, either of which may be used for voice or data by the end-user, and one 16K bit/sec D channel to be utilized for packetized data and/or control information (i.e., call set-up and shutdown). The BRI is meant to provide ISDN access via end-user devices such as terminals, PCs, telephone handsets, and faxes. The BRI, with its standardized access, will provide for the direct connection of most end users into ISDN. Only those user devices within high-speed LAN environments will be more likely to skip BRI and proceed into ISDN through a Primary Rate Interface (PRI) gateway system. Given that most end user devices (business and consumer) are not operating over megabit LANs, BRI will be the user interface of choice for at least the next five-to-10 years.

PRI specificies 23 64K bit/sec B channels and one 64K bit/sec D channel for use by the subscriber. In all, a total of 1.54M bit/sec is available within the PRI. The PRI is intended to provide bulk connectivity into the network from the computers, PBXs, LANs and high-end multiplexers, on a customer's premises. Although resembling a standard DS-1 (or T-1) circuit in bandwidth, the PRI, with its D channel attached, has much more potential in terms of flexibility, efficiency, and value-added delivery.

Terminal Interface Types. Basically, there are two kinds of terminal equipment: those devices that have built-in ISDN interface and signalling compatibility, and those devices which access ISDN through a converter device. Terminal Endpoint Type 1 (TE1) devices, such as an ISDN integrated voice data personal computer or ISDN video codec, are able to be directly connected into the ISDN. Terminal Endpoint Type 2 (TE2) devices support non-ISDN interfaces such as RS-232, V.24, Ethernet, and Token Ring, and require a BRI Terminal Adapter (TA) between them and the ISDN. A TA is a customer-owned and managed conversion unit that provides ISDN BRI access for devices with no such capabilities.



The BRI Terminal Adapter within an ISDN environment functions like the modem in today's analog environment. It will provide the connectivity for non-ISDN end-user devices such as terminals, PCs, workstations, telephone handsets, and fax machines.

Information Streams. As stated previously, the channel types are B and D. The B channel is a 64K bit/sec pipe for user information. That information can be data, voice, or video — or for that matter, anything else that technology provides in the future. Since the most aggressive ISDN service and equipment suppliers come from the voice-oriented world (e.g., telephone companies, PBX and central office switch vendors), the first wave of ISDN utilization will be in the voice-into-data market. This is where voice-initiated dialogues are blended with a computer-data component. The earliest applications for ISDN involve a voice call initiating data processing which results in a coordinated voice and data processing session for a telemarketing service representative.

This is not to say that the data-only side is being ignored. It is not. There are many people who require high-speed access across wide area networks. LAN-to-LAN connectivity is one scenario. Tying campus environment users into a multi-processor environment is another. And certainly, any T-1 (for data or voice/data) subscriber is a third. These applications are less exciting, but nonetheless real. They are also growing in volume, expanding in complexity, and broadening geographically at a significantly faster rate than voice traffic.

Out-of-Band Signalling. The concept of out-of-band signalling comes to us from sideband radio technology. The sideband technique has been utilized within certain portions of the world's phone network for many years. Its use within the entire phone system is very new and revolutionary.

At the heart of out-of-band signalling within ISDN is the D channel. The D channel is the control pipe for both PRI and BRI links. It is designed to carry control information that is related to, but not necessarily part of, the user information that will be contained in the B channels. The information streams that may travel the BRI and PRI D channels need not be unique to each of the two interfaces. The main difference will be in volume, with the PRI D channel needing to service 23 B channels, and the BRI D channel supporting just two. Appropriately, the D channel for BRI is rated at 16K bit/sec while the PRI's D channel specifies 64K bit/sec.

The reason this is so important is best explained through example. Network management is one of the most crucial applications that must operate within a network. However, the more robust and proactive a network management system becomes, the more of the network's bandwidth and processing power it takes up. Given this increase in load, a network management system's principal concern may very well be its own use of the network, a situation that neither a network nor financial manager wants to see. It could also be said that a network management system cannot manage effectively while actually being part of the network. After all, if the network goes down, the network management system is literally turned off, offering no help in any restoral of service procedure.

Out-of-band signalling also serves as the primary platform for many of the enhanced services provided through ISDN. Call set-up, when performed out-of-band, as opposed to today's in-band style, reduces set-up time from 20 seconds to about three seconds. This is the direct result of control overhead being minimized. Literally overnight, by making use of out-of-band signalling techniques, common carriers can free up transmission capacity. Although this is very significant for call set-up today, when we examine the pre-processing of information that will need to be performed for future telephony applications, this reduction in overhead becomes extremely significant.

Broadband ISDN. Broadband ISDN (BISDN) is meant to build upon ISDN's functionality by taking advantage of the widespread

availability of fiber optic technology. With lower error rates and much greater bandwidth potential, fiber optic transmission schemes allow BISDN specifications to reduce error checking overhead and increase information transfer rates to 150M bit/sec. Also of note is the fact that the Synchronous Optical Network (SONET) standards are being adopted for use within BISDN. SONET, initially a Bell Communications Research concept, calls for a more coordinated approach to fiber optic usage and is designed to provide speeds between 50M bit/sec and 13G bit/sec. SONET's inclusion in BISDN specifications bodes well for ISDN's capability to eventually overcome its current bandwidth limitations.

ISDN User Profile

CSX Corporation
The fifth largest U.S. transport company

Task at Hand
Centralizing control of its national railroad operations at a 90-person command center in Jackson, Fla.

Solution
ISDN Primary Rate Interface call-by-call service selection feature

Result
Five, not seven, T-1 access lines are required to support the center's inbound and outbound calls

Savings
$30,000 annually

CURRENT STATUS

The United States. The much-publicized ISDN trials of the last couple of years have enjoyed various levels of success. Unlike past trials of new and untested products, these beta sites were not necessarily trying to weed out the bugs in the technology making up the ISDN components. After all, the technology of ISDN transmission is made up of relatively simple and available mechanisms. Digital transmission is very widespread. Digital Customer Premise Equipment (CPE) is even more widespread. PRI is essentially a DS-1 (or T-1) service. BRI is just a multiplexed line supporting two 64K bit/sec circuits and one 16K bit/sec circuit. Instead, most of the beta efforts have gone toward making the components and services work together in a coordinated and reliable fashion.

So why the expense and trouble of all these trials? Because to the end user, the value in ISDN is in the applications (i.e., end-user services) it offers, delivers, and returns revenue on. The trials are intended to point the way to the promised application or applications. Given the success of IBM's Systems Network Architecture (SNA) because of transaction processing, and PC LANs because of peripheral sharing and peer communications, the proponents of ISDN view application success as driving ISDN success. They are quite right in this estimation.

ISDN (or ISDN services) are just now rolling out into the paying end user community on a tariffed basis. AT&T received approval for its tariffed offerings in the Summer of 1988 after filing for them the previous Spring. By the end of 1989, AT&T planned to make its ISDN PRI service available in 73 cities. By the end of 1990, a total of 290 AT&T central offices will offer ISDN PRI services. Ameritech, through Illinois Bell, was able to offer ISDN services at the same time as AT&T. Pacific Bell and Southwestern Bell have also filed tariffs for services within the past few months.

The European Economic Community. Europe and its Postal Telephone & Telegraphs (PTT) are considered to be a year or so ahead in deployment. This varies from country to country in Europe. France has ISDN capability in approximately 75% of its central office switches, while Germany is only about 40% ISDN-ready. Where ISDN is ahead in Europe specifically relates to services for the end-user. Competition within the European Economic Community is intensifying as a result of the 1992 decree. This near-future political, economic, and technological openness of European industry has driven the PTTs toward ISDN at a faster pace than their U.S. counterparts (i.e., the Interexchange Carriers [IXCs], Regional Bell Operating Companies [RBOCs], Bell Operating Companies [BOCs], and Other Common Carriers [OCCs]). The PTTs, by implementing ISDN faster and offering more robust services, protect themselves in the upcoming competitive environment of 1992 and beyond. It also positions them better for international and intra-EEC competition in this same timeframe.

Although the Europeans are viewed as further along the curve of ISDN services, it is believed that the more advanced U.S.-based ISDN service providers will equal and, in some cases, surpass their European counterparts within the next couple of years. With the crumbling of regulatory barriers pertaining to where and what telecomm services any particular company can provide, and the driving forces within the commercial world pertaining to where, how, and to whom products and services must be offered, ISDN in the U.S. is just now showing signs of gaining momentum. International Data Corporation (IDC) believes that the growth of ISDN access lines will build from the approximately 200,000 lines installed today to three-quarters of a billion in the year 1995.

SPECIFIC CAPABILITIES AND RESULTING BENEFITS

The ideals of ISDN sound simple. Unfortunately, the implementation of these ideals is complex. The complexities come from the different interpretations of these so-called standard interface definitions and the fuzzy nature of the wide-ranging services. The reality of today's ISDN benefits the user by simplifying the connection to the network and by providing better performance through that connection. The capabilities that are promised through enhanced services and functionality are embryonic and won't be fully realized for some time to come. The leading edge users are just now scratching the surface and are spending a lot of time, energy and money doing so.

End-to-End Digital. Converting our wide area networks to digital provides us with two distinct advantages over the older analog configurations that have been in use since the Bell system was first formed. The first is certainly a reduction in error rates. Digital technology and improvement in media account for error rates in the order of one in one billion bits. By comparison, LANs can push rates as high as one in one trillion. The second is performance. Without digital technology, rates of 64K bit/sec and above are simply out of reach. If one is to prepare for the exponentially higher bandwidth needs of future information systems (e.g., LAN-like wide area network access is already in great demand by many larger corporations), then end-to-end digital is a must.

Although easily overlooked, but very much an influencing factor here, is the fact that all end nodes are digital (or at least are becoming digital). PBXs, computers, PCs, and fax machines, are all based on digital technology. The ease of placing a digital user device on a digital network should not be overlooked in this worldwide network conversion.

Integrated Access. The long awaited integration of voice and data culminates in ISDN. Up to now, the voice world and the data world were only brought together within a transmission scheme. At best, they would share multiplexing equipment. At times, they would share wiring and circuits. Most of the time however, voice and data would go their

separate ways. The processing and information contained within each type of stream still remain very much separated. ISDN is pushing at both ends, driving each of these types of information closer together. Not just by making voice digital and simply putting data through a voice PBX, but rather by causing data and voice to be processed and linked together within a logical system.

Right now, voice call pre- and post-processing represents the most innovative technology within ISDN. The reduction in call set-up time from 20 seconds to three seconds via out-of-band signalling techniques is the most readily apparent benefit of ISDN. Shutdown has also been reduced similarly. These reductions allow not only for reduced overhead in switches and facilities, but also enable the provision of enhanced services like Call-by-Call service, which allows the on-demand allocation of bandwidth for changing needs, and Automatic Number Identification (ANI), which provides information about a calling party to the called party.

ANI allows voice-oriented information (i.e., caller's telephone number) to prompt processing activity within the data center, making both voice and data streams appear before a telemarketing or customer service agent simultaneously, with the voice stream being delivered via a ringing phone and the data stream being delivered via a formatted display screen. The obvious flaw in ANI is that you must call from a known telephone. For example, if you call from home, that's great. If you call from a pay phone in East Oshkosh, Wisconsin, ANI is defeated.

There is also the benefit of integrated access from the perspective of information accessibility. In many ways, by aligning the world's telecommunications networks into one ISDN, services for end-users would become truly universal. No longer would one have to be connected to the right network to gain access to the right information. Now granted, this is the ideal, but it is an intended goal for ISDN. And since ISDN is the most globally influential and potentially pervasive networking technology, it is the logical choice for providing this all-encompassing end-user information access.

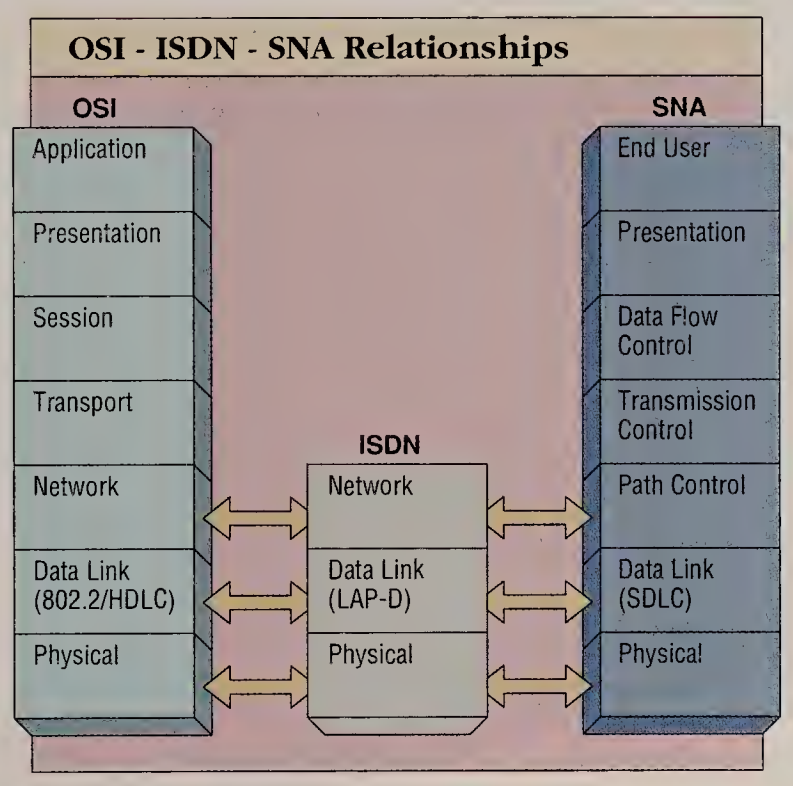
High-Speed Information Transfer. From the outset, ISDN was designed to provide high speed service to the user's desktop. Speed, however, is relative. The 64K bit/sec delivered by ISDN is far faster than what many users had in the past, but far slower than today's 4M and 10M bit/sec LANs.

Fortunately for ISDN, however, most business users are not connected to megabit LANs and home users with their 1,200 and 2,400 bit/sec modems, will benefit greatly from 64K bit/sec. Some examples of others who would benefit are remote sales offices, data entry pools, help desks, and telecommuters. We use the term remote here, rather than distributed, because these locations would be dependent on a remote processor for information. In many ways, ISDN can be labelled for the time being as the poor man's technology, serving best those people who had neither the money nor the internal fortitude for upgrading their local area and wide area networking systems in the 80s. ISDN is, in effect, the technology that allows the trailing edge to play catch up. This is not to say that ISDN is not for the leading edge. With companies like American Express, Chevron, and Boeing investing resources in ISDN, one can be sure that even the most enlightened network gains through ISDN access.

At 64K bit/sec, information transfer can occur about 6 1/2 times faster than at 9.6K bit/sec; 13 times faster than at 4.8K bit/sec; and 53 times faster than 1,200 bit/sec. For a terminal user at a remote location using a PC with a terminal emulator package over a 1,200 baud modem, ISDN is a panacea. Even for those users of high-speed modems, a 64K bit/sec clear digital channel is a great improvement given that most of these modems often fall back to lower speeds over analog lines. Data applications which go beyond file transfer and electronic mail are especially enhanced. With graphic images growing more widespread and application interactivity increasing along with easier to use interfaces, the need for higher speed pipes between processors is expanding exponentially. The popularity of multi-megabit LANs have demonstrated this need for bandwidth.

The speed of B channels won't have an impact on voice performance. 64K bit/sec is the speed at which today's voice conversations occur. However, because of the end-to-end digital aspect of the signal, voice quality will be noticeably better in the ISDN world. Imagine having the same signal quality across the country and the world as you are afforded when speaking with someone connected to the same digital PBX today.

An ISDN B channel does not fully support full-motion video transfer. Video requires bandwidth. A present day television set, if being serviced through digital technology, would require up to a 90M bit/sec bandwidth if uncompressed. The new High-Definition TVs (HDTVs) could easily double that requirement. Today's video codec technologies operate fairly well at 56K bit/sec, but actually achieve full-motion at 384K bit/sec. Certainly, the widespread availability of 64K bit/sec channels will make full-motion interactive video conferencing more easily accessible, but there must be greater improvements in quality before video can really take off at the desktop level. However, knowing that 64K bit/sec will be widely available for desktops makes it easier on companies reaching for better video quality. Instead of worrying about 9.6K bit/sec or lower speeds, the efforts can be aimed at 64K bit/sec, allowing for more focused research and quicker payback upon acceptance. There is nothing like the promise of revenue generation to motivate technology breakthroughs.



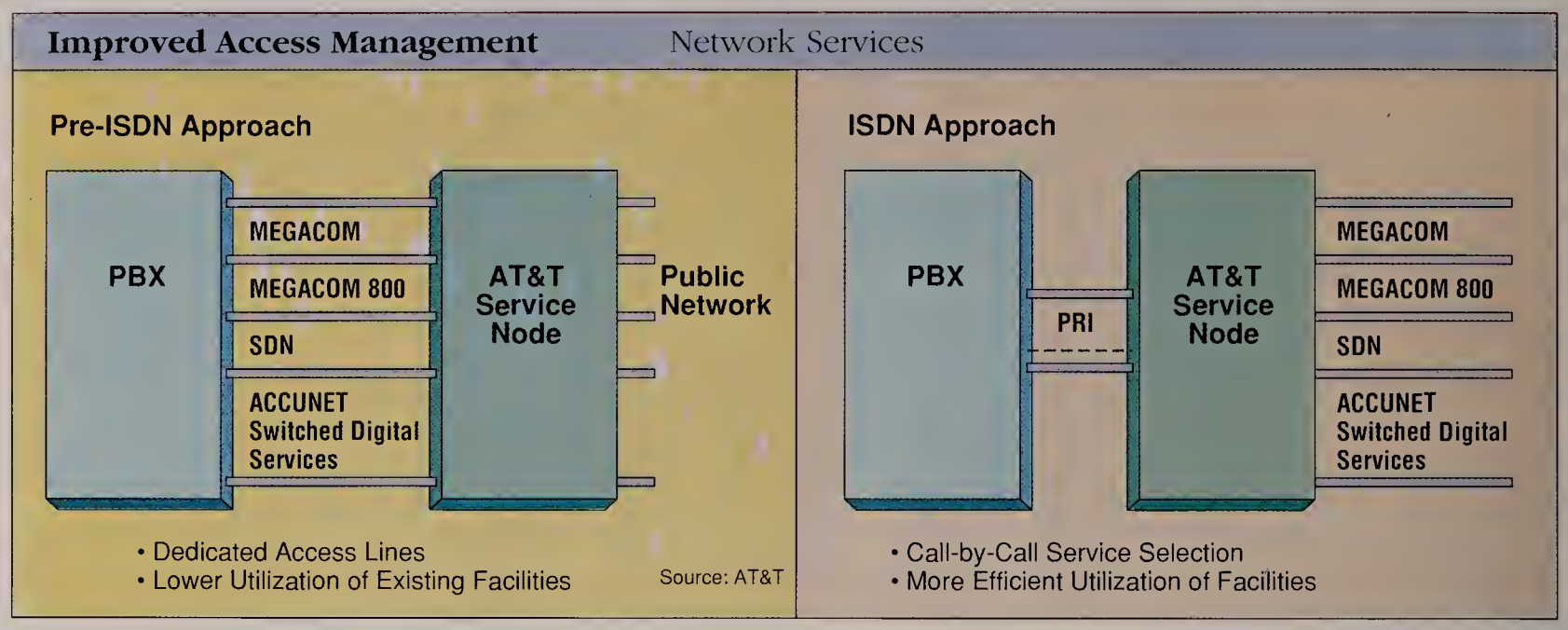
CCITT Compliance. All the ISDN equipment and service providers work from the same set of ISDN "Red" books of standards. However, these standards leave a lot to be desired and interpreted. There is no guarantee that one vendor's ISDN equipment will work with another vendor's. As a matter of fact, more often than not, they probably won't. There is little in the way of conformance testing for ISDN products. There is no Corporation for Open Systems (COS) equivalent for ISDN. The North American ISDN Users' Forum serves as a good focal point for user likes and dislikes, but it is not taking responsibility for testing equipment and service interoperability. The trials and the early paying customers best exemplify who works with whom. The RBOCs and AT&T, because of their mediator-like role in ISDN in this

Real-World Centrex.

In the tidy world of diagrams, nobody ever moves to a new office. Or changes jobs. But in the real world, moves and changes create telephone chaos. Where can you find a phone system that puts you back in control? At your local phone company. With advanced Digital Centrex Service provided from the Central Office, you get to control, assign and service your own phone lines. Make your own moves and changes. Right from your own premises. Employees get to keep the same phone number no matter where or how often they move. And you get to keep your sanity. All thanks to the state-of-the-art 5ESS® Switch from AT&T Network Systems. Need a change? Make a move. Call your local phone company.

You and Your Local Phone Companies

AT&T
Network Systems



country, keep tabs on equipment being tested within their trial sites. (See box description of Southwestern Bell's ISDN test lab).

So what does one do to guarantee compatibility? Well, in essence, nothing. Customers must at least make sure that products were built to CCITT spec. Vendors of ISDN compatible equipment keep fairly up-to-date lists of other vendors that they work with. Most vendors are trying to expand these lists rapidly. Obviously, the longer your list, the better positioned you are to sell ISDN equipment. Customers should check to view working vendor configurations. Next, check the ISDN telco service provider's list of approved products. As the services come on-line and are tariffed, these lists will become more and more complete. Beyond these items, there is very little guarantee that your bright new shiny ISDN box will work with your new and wonderful ISDN service.

TARIFFS AND AVAILABILITY

Illinois Bell, the first BOC to tariff ISDN services, priced an ISDN BRI circuit at just under $30 a month. Their Centrex lines cost between $15 and $18 per month. Given that a BRI line offers 2.25 times the performance (who knows the potential functionality improvements), a 1.6 times price increase for ISDN BRI is a pretty good deal. It is expected that as other RBOCs tariff BRI, the price range will be between 1.5 and 2.0 times Centrex line pricing. As competition heats up, regulatory barriers crumble, and services become more ubiquitous, this pricing structure could decline even further to where an ISDN BRI line costs the same as today's Centrex line. However, this probably will not happen for at least two-to-five years.

By way of services, AT&T prices its PRI service at $400 per month, with a $3,000 installation charge. Their INFO-2 service, AT&T's ANI offering, is priced at two cents, which decreases to one cent for each call above 60,000 per month. That is, each caller's source number is provided to the receiving party for two cents per call. ANI is the current driving force behind all pre-processing of caller information.

APPLICATIONS

Telemarketing. The two primary examples of telemarketing applications are used by two of the earliest customers of AT&T's ANI service: American Express and American Transtech. American Transtech is one of the largest telemarketing companies in the U.S. and just happens to be an AT&T company. Both companies utilize information provided over the D channel to direct access to databases of information about a caller prior to talking with the customer. The look-up of the caller's information and the presentation of the information to the service agent occurs in parallel with call set-up to the agent. This processing takes place in milliseconds. The delay is not apparent to you or the agent. As a matter of fact, because of the efficiencies of the newer switches and facilities, all this additional processing activity could easily occur in less time than it would take for non-ISDN technology to simply complete a call. The productivity of the agent is enhanced and customer satisfaction increases. Both contribute toward more sales and repeat business.

At American Express, the process goes like this: a Gold Card member has a question about his or her account. They call their 800 number for client service. Prior to the phone ringing at the customer service agent's desk, caller information is received through the D channel by an AT&T PBX. Through a PRI interface, that information is passed to a computer system running a database application that matches the caller's data against their American Express history. Processed information, such as a copy of the latest bill, a list of outstanding charges, and some background on the account, is then routed to the service agent's terminal. That agent then picks up the ringing phone. Remember, this pre-processing takes literally fractions of a second and would be completely transparent to the caller.

Corporate Networks. In an age where individual company networks are being organized into one large corporate entity, it makes sense to have everyone talking the same language and having access to information wherever it may be. For years, many larger organizations have found themselves in the uncomfortable position of having to invest in and operate their very own telephone company in support of internal telecommunications needs. Through privatization and the growth of hybrid networks, corporations have taken on much more responsibility where their networks are concerned. In many cases, this responsibility has overwhelmed those within corporations ultimately responsible for such networks. IDC's research has indicated for some time that networking advancements have outstripped the ability of corporations to operate, manage, and plan them effectively. Given the shortage of staff and expertise and given the rather slow pace of intelligent network management systems development, this gap will only grow larger over the next few years. In this situation, IDC believes it makes perfect sense to offload a certain amount of network responsibility onto companies that specialize in the design, delivery, and management of networking equipment and services. This frees up resources that are better utilized when directed at primary business activities, such as manufacturing widgets, curing the sick, managing money, or

flying planes. This is not to say that corporations should abandon networking concerns nor should they abandon their private networks. Rather, if ISDN is to provide intelligent services, then it is our responsibility to take advantage of this intelligence where appropriate, not try to reinvent our own.

Over the next five years, corporations will grow to realize that hybridization will principally involve mixing specialized private equipment with general-purpose ISDN public services.

Role in Government Networks. The government, mostly through the National Institute of Standards and Technology, is probably the biggest proponent of standardized networking technology. Witness the commitment to and effort involved in the FTS 2000 procurement, which was to date the single largest telecommunications project ever. Since ISDN is one of the two or three most influential standards in networking today, the defense and public agencies of the government would be well advised to start building toward ISDN. Network equipment purchased for use beyond three-to-five years (i.e., everything in the government) should be ISDN compliant. Due to their more demanding requirements for interoperability among very large organizations, the Department of Defense specifically should be aggressive in preparing itself for a combined voice/data/video wide area network comprised of ISDN equipment and services. Also, since many government installations utilize Centrex, those organizations will, in many ways, be best positioned to become ISDN customers within the next couple of years.

As far as applications are concerned, it is not readily apparent how applicable the early work in ISDN will be for the government. After all, the government is not in the telemarketing business. However, significant gains in performance and efficiencies will be made by simply utilizing the digital high-speed capabilities of ISDN public facilities. Considering much of the government's networking technology is based on older analog facilities and equipment, the technology of ISDN is viewed by much of the commercial world as being already available and will actually be quite a welcome upgrade for many government networked systems.

The aspect of security is also one that should not be overlooked. A more intelligent network is also able to be a more secure network. Things like out-of-band signalling allow for more intense scrutiny of traffic while eliminating the overhead and performance penalties usually associated with such scrutiny. Also, the software orientation of switching technology associated with ISDN provides a more flexible environment for implementing security features. An old hard-wired switch is not an easy thing to upgrade. A new ISDN processor will be much easier to tailor for specific requirements within different sectors of the government.

THE FUTURE

Timeline for Adoption. There are really two waves associated with ISDN acceptance and implementation. The first involves those companies with a large stake in consumer service. Any company that makes money by servicing a large client population should begin the process of ISDN implementation. American Express and American Transtech have broken new ground over the past year. Companies with a similar orientation should plan to make their own investment in ISDN within the next two years. Failure to make a commitment to ISDN within two years will result in a company being significantly behind in the service game.

The second wave of ISDN utilization involves companies that would benefit from the non-application (i.e., lower level functional) gains realized by ISDN. Many of the early paying customers of ISDN (e.g., Chevron Information Technology Co., Tenneco, Inc., West Virginia University, Apollo Computer and Boeing Computer Services Co.) fit into this category. These companies are consolidating their voice and data networks, upgrading their facilities to higher bandwidth and digital capabilities, building greater flexibility into their wide area networks, taking a more enterprise-wide approach to networking and/or adding new premise equipment into their networking scheme. These companies presently derive little benefit from ISDN as a new-wave application platform. Instead, these companies will simply take advantage of ISDN as a provider of a flexible, digital, high-performance, and intelligent network technology. For organizations looking for similar gains in networking, implementation should spread out over the next six years. The early adopters will be those with less investment in distributed processing, LANs, and intelligent premise-based WAN management systems. Current users of Centrex are almost ideal candidates over the next two years. Beyond 1995, there will be few reasons not to make use of ISDN within some segment of an organization's network. The service will be that mature and ubiquitous.

Future Directions and Applications. Already basic specifications are established for BISDN. It is said that BISDN will be the real driving force behind ISDN technology acceptance and utilization. Because of the advancement of other technologies (e.g., LANs, value added networks, T-1, and T-3) and because of the tardiness of the initial ISDN products and services, the higher bandwidth and even more advanced services available within BISDN are viewed by larger and more sophisticated user organizations as the "real" ISDN. The Japanese have been very aggressive in preparing for BISDN. They are not necessarily ignoring today's standard ISDN, but rather, minimizing their commitment to it in light of the benefits of the higher speed BISDN.

Presently, ISDN's orientation toward the business market and limited availability restricts its ability to deliver on its promised worth. ISDN will finally deliver on all its promises and reach its full potential when the service becomes ubiquitous and reaches into the home. Technology, accessible through the home, is not nearly as sophisticated as that which has spread throughout large, medium, and even small businesses. Whereas businesses may need to fully justify the displacement of already sophisticated technology, the home user has only to displace an analog telephone set and maybe a PC modem. And the services offered to the home, such as call forwarding, video telephony, voice/data mail, and videotex, are some of the most exciting for ISDN. △

ISDN User Profile

Nice Corporation
A 2,000-agent telemarketing company

Task at Hand
Processing more calls and decreasing the time spent on each order

Solution
ISDN Primary Rate Interface to transmit and receive customer data

Result
Dramatic reduction in $5,000 per month 9.6 bit/sec leased line

Savings
Millions of dollars annually

Real-World ACD.

Better service? Everyone salutes the idea. But in the real world, how do you make it fly? For the airline industry, the answer comes from their local telephone company. Using AT&T Network Systems Automatic Call Distribution (ACD) equipment, local telephone companies can provide airlines with a better way to answer their customers' calls. The incoming calls of their most important customers fly non-stop to their most experienced agents. And calls from less frequent flyers? They're answered quicker too. ACD programs can help airlines land more customers. See how they can help your business take off. Call your local telephone company.

You and Your Local Phone Companies

AT&T Network Systems

EDITORIAL REPRINTS FROM

Network World

REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS
REPRINTS

Highlight your editorial coverage!

Coverage of your company's news or product introductions in *Network World* means valuable exposure in the enterprise networking marketplace. Build on the positive awareness by ordering your reprints today.

Editorial reprints make great leave behinds for:

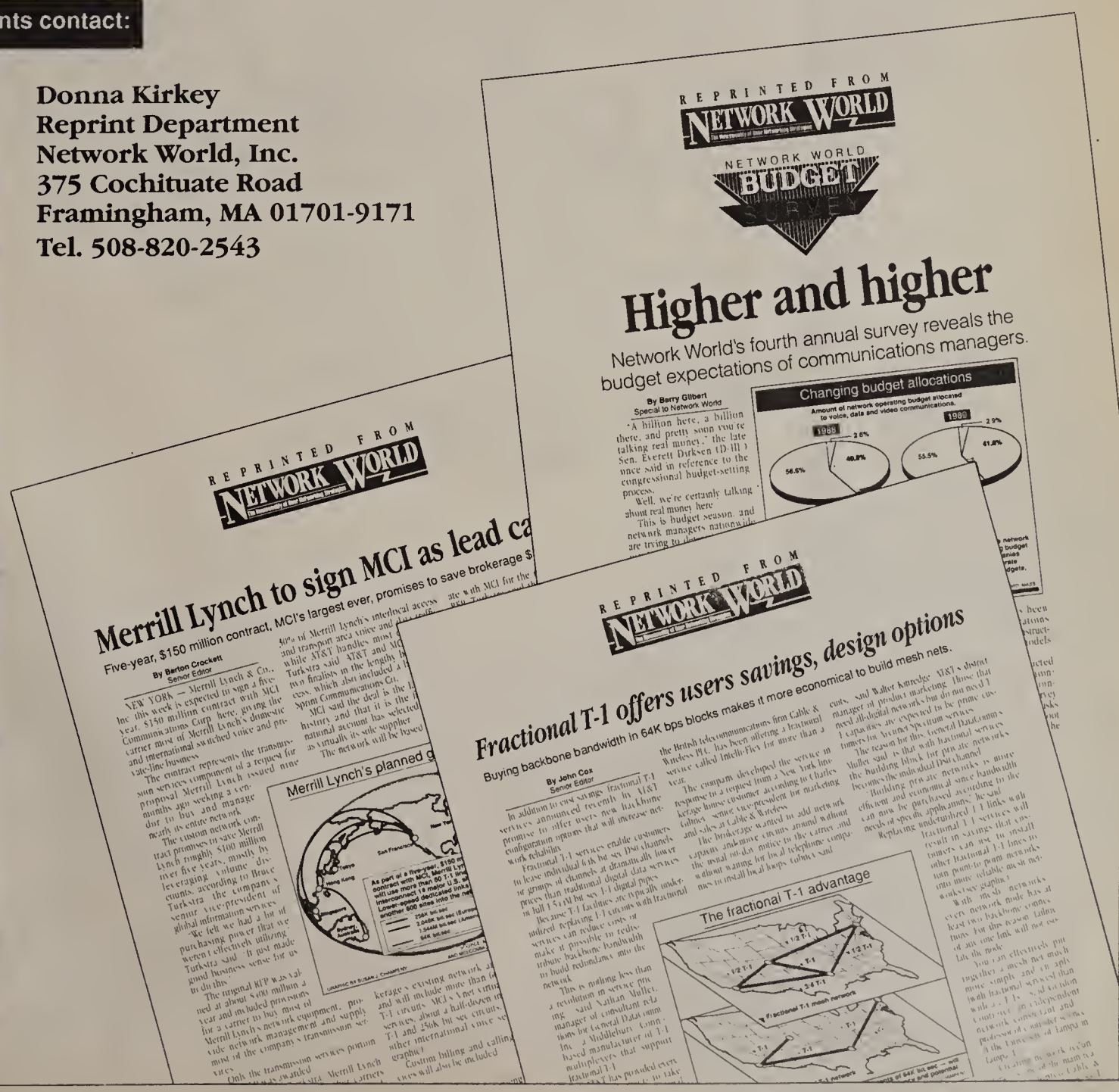
- Press
- Trade Shows
- Sales Prospects
- Distributors
- Company Seminars
- Internal Meetings

Reprints are available in various quantities* and can be customized to include your company logo, address and sales office listings.

*Produced in minimum quantities: 500 for black & white or two-color, 1,000 for four-color reprints.

For information on ordering reprints contact:

Donna Kirkey
Reprint Department
Network World, Inc.
375 Cochituate Road
Framingham, MA 01701-9171
Tel. 508-820-2543



LAN-to-WAN links, central-site net control top user issues in the '90s

By Joe Panepinto
Staff Writer

ELLICOTT CITY, Md. — Central-site network management and the interconnection of local- and wide-area networks (WAN) will be the two biggest issues facing network managers in the early 1990s, according to a recent survey.

The survey identified the top eight issues facing network managers in the first half of this decade (see chart, page 39). It was based on interviews with 170 network managers in finance, manufacturing and service companies with average annual voice and data communications expenditures of $2 million.

Forty percent of the net managers interviewed for the study, conducted by Newton-Evans Research Co., Inc., based here, said establishing central-site network management would be users' major concern. The second most important concern was the interconnection of LANs and WANs.

Network integration and consolidation was rated third in the survey, with integrated services and cost-effectiveness of overall network operations tied for fourth.

Only 15% of the net managers surveyed said they believed increased bandwidth would be an important issue in the 1990s.

Network World asked other users how their concerns matched those cited in the survey findings. Most said network interconnection was their primary issue, followed by cost-containment.

Sid Smith, manager of telecommunications at Crowley Maritime Corp., a marine transportation and cargo company based in San Francisco, expects that as markets become more global, net managers will be faced more often with the task of integrating nets based on different protocols.

Smith said he expects an explosion in Integrated Services Digital Network applications and continued regulatory battles among the nation's long-distance carriers.

"We just see the tip of the iceberg with MCI and AT&T suing each other left and right," Smith said. "From the user management point of view, how it comes out is going to be very important."

Harvey Shrednick, vice-president of information services at Corning Glass Works in Corning, N.Y., said he believes a major challenge facing information systems managers will be maximizing their companies' return on their technology investments.

"Now that we put in a telecommunications infrastructure, how can we maximize our investment to speed communications and optimize the decision-making process throughout the company?" he asked.

He said he foresees network managers focusing more attention on the strategic business application of geographically diverse information systems.

But basing business decisions on networking possibilities is a difficult task, considering the speed with which technologies change, according to Ron Thornhill, vice-president of network services at Mastercard International, Inc. in St. Louis.

"In communications, capacity and reliability is going up and the cost is going down," Thornhill said. "The trick is taking advantage of that."

Thornhill echoed the findings of the study, saying network managers in the '90s will be forced to bring together the various management systems of different vendors under a single network management system in an effort to improve efficiency.

Drexel builds net to support enterprises

continued from page 39

next summer, the company will migrate private voice lines to the T-1 backbone and put as much switched voice on the network as possible. The remaining switched voice will be handled by the VNet service.

"By packing our T-1s to capacity with switched voice, we maximize our use of the bandwidth and don't lose money," Higgins said.

Should customers purchase bandwidth on the network, Drexel Burnham Lambert will simply buy additional T-1s and fill up any excess capacity with more of its own switched voice. "We have bucketfuls of switched voice to use," Higgins said. In this way, the company will always be running its network at full capacity.

Risky business

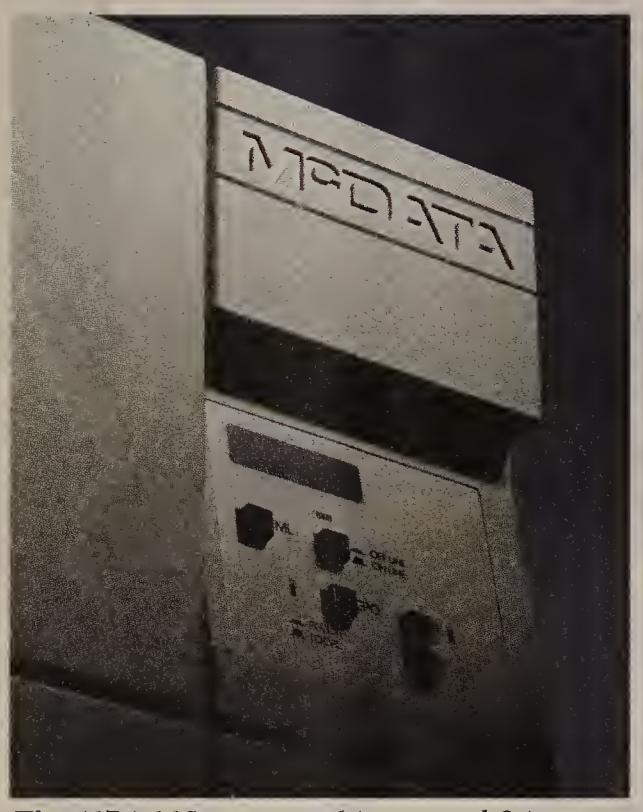
Meanwhile, Drexel Burnham Lambert has hired a sales manager to pitch the company's technical services in the marketplace. The company expects to generate a lot of business because it will charge much less than most of its competition — mainly service bureaus, third-party network providers and consulting companies. "We are pricing services just to offset expenses, not to make a killing," Higgins said.

Higgins admitted that there are risks in selling computing and network capacity to outside clients. Companies can easily be tempted to oversell capacity on their systems. Then if their business takes an unexpected upturn, they might run out of capacity and be forced to make hasty upgrades.

"You have to be very careful, and you have to have a well-thought-out strategy," Higgins said. "Otherwise, it could come back to bite you."

We've made a name for ourselves in connectivity but you don't know it. Yet...

Though we have an installed base of more than 70,000 connectivity devices in more than 38 countries, a worldwide distribution and service system, and are the second-largest manufacturer of 3174 compatible cluster controllers, McDATA is not a familiar name in the industry. Until now, our controllers and other products have gone by many names, sold under private label to widely known vendors.

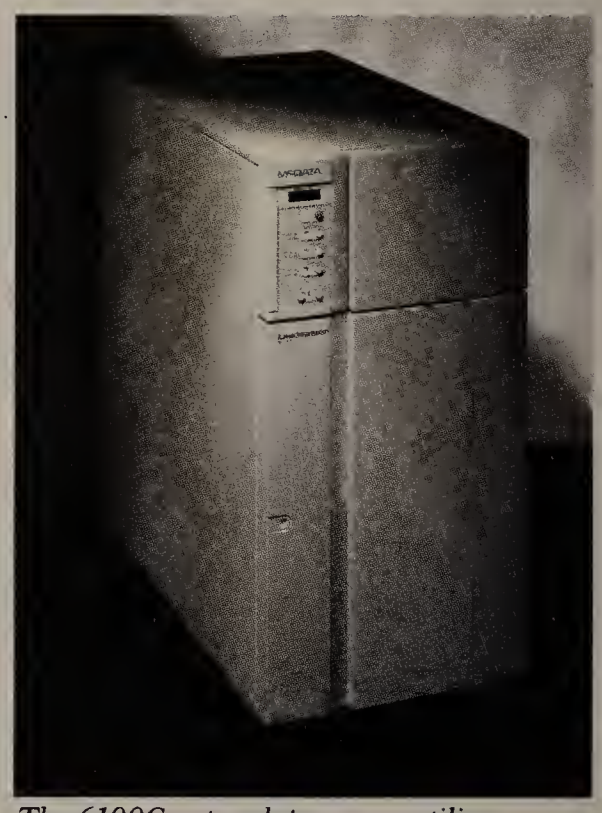


The 4174 11L supports 64 coax and 24 ASCII devices plus a token ring.

Now we are stepping forward. Twenty new LinkMaster® products, sold under our own name, will change the way the information networking industry thinks and acts about connectivity.

McDATA raises network communications to a new plane of efficiency, going beyond plug-compatibility to a sophistication in connectivity which represents a value in itself, not just a workaday necessity.

For example, for bulk file transfers between hosts, the LinkMaster 6100C network processor allows files on a host to be sent quickly and effectively to not just one, but multiple hosts in multiple locations.


The 6100C network processor utilizes existing channel connections for direct NetView interface.

Using the LinkMaster 5000 series of channel extenders, disaster recovery backup tapes can be made offsite whenever they are needed, eliminating the time and expense of manual tape transportation.

The 5000 series of channel extenders can be installed in less than one hour.

LinkMaster 4174 controllers interconnect 3270 terminals, ASCII terminals and PCs to multiple hosts, either DEC or IBM. And LinkMaster products enhance network management with direct NetView interface.

These are just a few highlight examples of McDATA's LinkMaster network solutions at work.

LinkMaster goes beyond compatibility to the next stage of the network communications evolution, a comprehensive multivendor connectivity which, in high-speed, long-distance channel communications, represents the next significant horizon to be crossed.

The new standard in managing large systems involves faster, more economical, more rational channeling of data across communications barriers which previously could not be spanned. McDATA is establishing that standard.

We span the gaps in network communications. **McDATA**

McDATA Corporation 310 Interlocken Parkway Broomfield, Colorado 80021 (303) 460-9200 **Boston/Chicago/Dallas/Atlanta/Los Angeles/San Francisco/Washington, DC/London/Munich**

See us at COMNET booth #638.

DATA

If you don't have FastPacket yet, perhaps you should take another look at your digital network.

If your network is still using circuit switches, it's consuming more bandwidth and financial resources than it needs. And that affects your performance in the marketplace.

Because the big issue in telecommunications isn't how much your network is costing your company, it's how much your network is making your company.

Which is why you should investigate FastPacket.®

With FastPacket, your network becomes more than just a highway for voice and data. It becomes a real competitive weapon you can leverage against your competition.

FastPacket is the only system that actually reduces network delays. Thereby reducing the processing cost of every transaction. And increasing the number of transactions your network can accommodate.

FastPacket is the only system that promises you 99.99% uptime. Guaranteed. And that's crucial to the health of your business. Because if your network goes down even momentarily, your business stops doing business. And your customers start going elsewhere.

What's more, FastPacket is the only system that provides you with a cost-effective growth path to the bursty, high-speed demands of the LAN/WAN data networks of tomorrow.

So you can count on future growth.

It all adds up to the most cost-effective, reliable and adaptable bandwidth management system in the world.

FastPacket is already saving hundreds of thousands, and often millions of dollars, for banks, airlines, financial institutions and a host of other corporations who depend on their networks for survival.

Don't let your network consume bandwidth and dollars it doesn't need. Call us today at 1-800-537-7707.

Or visit us in *Washington D.C. at the COMNET Show, February 6-8, in booth #1446.*

We'll put your network on a diet that will make a healthy difference in your profit margins.

STRATACOM®

The FastPacket Company.™

INTERNATIONAL NETWORKS

USER STRATEGIES, INTERNATIONAL SERVICES & REGULATION

Worth Noting

Between 1990 and 1992, rates for dedicated transpacific circuits over satellite and fiber-optic facilities will decline 30% to 40% because of the extra capacity and greater competition spurred by new fiber-optic cables, predicts Leonard Elfenbein, president of the Little Falls, N.J.-based consulting firm Lynx Technologies, Inc.

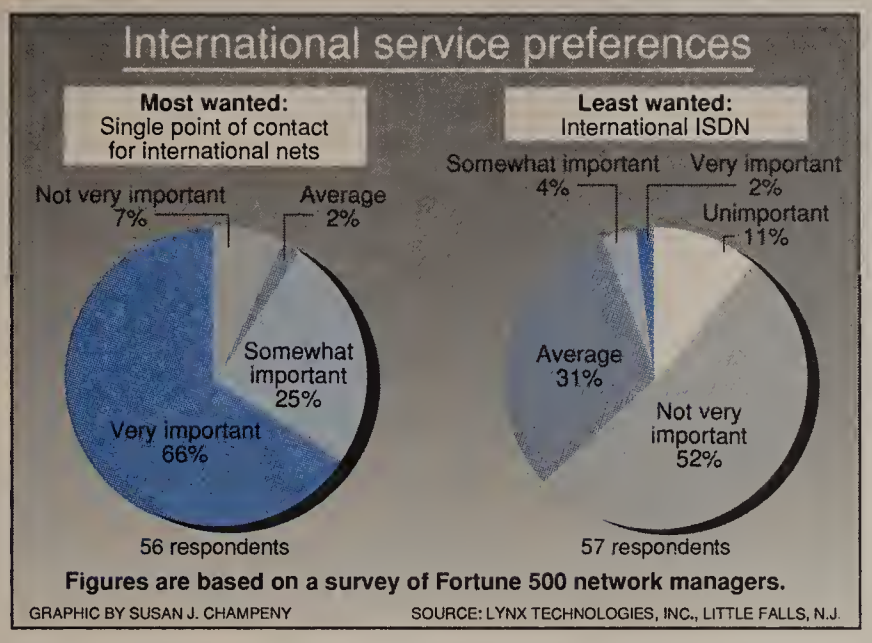
World News

AT&T plans to cut over one more transatlantic fiber-optic cable and another transpacific fiber-optic cable with landfalls on the mainland U.S. in the next two years. The carrier is considering another three cables for both oceans by the end of the decade, said Frank Fahey, AT&T's deputy director of international network and facilities engineering.

Currently, AT&T has only one fiber-optic cable in operation over each of these oceans, Trans-Atlantic Telecommunications-8 (TAT-8) and Hawaii-4/Trans-Pacific Cable-3 (Haw-4/TPC-3). Fahey said a TAT-9 cable with two 560M bit/sec channels is scheduled for cutover in the fall of next year, and a TPC-4 with the same capacity between the U.S. and Japan is scheduled for 1992. He said AT&T is considering a TAT-10 and TAT-11 in the mid- and late 1990s, and a TPC-5 around 1997.

The Information Technology Association of New Zealand is threatening to file suit against **Telecom New Zealand,** asking that a doubling of rates for the national carrier's 2.048M bit/sec Megaplan service be stopped.

This and other complaints may lead to action against the carrier for anticompetitive practices.



Managers fill out wish list of global network services

Survey examines user demand for int'l offerings.

By Barton Crockett
Senior Editor

LITTLE FALLS, N.J. — Users running global nets say they want a single point of contact for multicarrier networks more than any other international service.

In a recent survey conducted by the consulting firm Lynx Technologies, Inc., based here, nearly 90% of the more than 50 network managers responding said that having a single carrier order and maintain circuits for their entire global net is important to them.

The demand for this service contrasted starkly with the tepid user interest in international Integrated Services Digital Networks, according to Leonard Elfenbein, president of Lynx Technologies. Only 5% of the respondents said international ISDN is somewhat or very important, while 53% said international ISDN was not very important (see graphic, this page).

> "Managers are more interested in reliable service than the latest technology."
>
> ▲▲▲

"This confirms the fact that managers are more interested in reliable service than the latest technology," Elfenbein said.

In December, Lynx compiled results from the questionnaire, which was mailed to more than 100 Fortune 500 communications managers. While total expenditures on international communications varied among the respondents, most spent in excess of $25,000 per month on international leased lines. Most of the respondents also used international value-added networks (VAN), although total expenditures on international VAN services were not broken out.

According to Elfenbein, one of the most revealing survey results was the high interest in single-point-of-contact services for global networks ("One-stop shops ease global networking," *NW,* Dec. 18, 1989). No other service was ranked as important by such a large number of respondents.

"Clearly, users have had enough of dealing with foreign PTTs, and they want to off-load as much of that as possible to their carrier," Elfenbein said.

Users also cited the need for new services and regulatory changes that would make it easier to build private networks. More than 60% of the respondents said that easy public network-to-private network access was either somewhat or very important. In most foreign countries, this is partially or severely restricted. Three-quarters of the respondents said that rapid implementation of circuits was somewhat or very important to them.

Nearly half of the respondents said that the ability to reconfigure an international network easily was somewhat or very important.

Several technologies stirred up suprisingly little interest, however.

For instance, more than 60% of the respondents said that the availability of fiber-optic circuits was only of average or less than average significance.

Likewise, 30% of the respondents said that having their own very small aperture terminal satellite network was not very important. In several industrialized countries, particularly in Europe,

(continued on page 48)

Satellite monopoly may end in Canada

Government initiates review of regulations that may lead to wider options for transborder nets.

By Barton Crockett
Senior Editor

OTTAWA — Canada's monopoly satellite services market may be about to burst open.

Last September, the country's Department of Communications, based here, began a review of federal transborder satellite regulations that could eventually lead to free competition between Canadian and U.S. service providers. Currently, such competition is prohibited. The Canadian end of any transborder satellite network must be obtained through the monopoly carrier Telesat Canada, based here, which provides transmission services using either its own satellites or those owned by U.S. carriers.

Canadian and U.S. satellite providers are prohibited from selling services directly to end users in each other's country.

Vendors and users say it's likely the government will decide that an open market is in the national interest and approach the U.S. about allowing transborder competition. It is believed that the U.S., a vocal advocate of international free trade, would be receptive to such a move.

"We've been preparing for this to come about," said a Telesat Canada spokesman.

Competition between U.S. satellite service providers and Telesat is possible because the firms' satellite footprints cross national borders. U.S. satellites can supply service to at least the most populated regions of Canada, which are concentrated near the border.

Currently, Telesat satellites only have limited coverage of the U.S., but this will change when the carrier launches its Anik E satellites later this year and in early 1991. These satellites will employ advanced antenna technologies that will enable them to supply service to most of the continental U.S.

Users say that any move to open up competition between U.S. and Canadian satellite service providers would be a welcome change.

"It could lower prices and lead to better service and more alternatives," said Tom Egan, manager of telecommunications at Welland, Ont.-based Canadian Tire Acceptance, Ltd.

Egan, a user of domestic Cana-

(continued on page 48)

Transpacific fiber link promises new net options

VANCOUVER, Wash. — A new undersea fiber-optic cable that promises to give users a wider array of options for transpacific communications is scheduled to be cut over by the end of this year.

The 1,260M bit/sec North Pacific Cable (NPC) is also expected to reduce the cost of transpacific communications by giving users an alternative to the Hawaii-4/Trans-Pacific Cable-3 (Haw-4/TPC-3) fiber-optic cable.

"It will cause competition, which should cut prices," said Sunil Tagare, director of the undersea consulting group at the Newport, R.I.-based consulting firm Kessler Marketing Intelligence Corp.

Currently, dedicated circuits over Haw-4/TPC-3 cost about 25% more than equivalent satellite facilities, Tagare said. He predicted that once NPC is cut over, the price of fiber circuits will begin declining so that by 1992, when the TPC-4 undersea fiber-optic cable is expected to be cut over, the cost of dedicated transpacific fiber circuits will be about equal to the cost of satellite facilities.

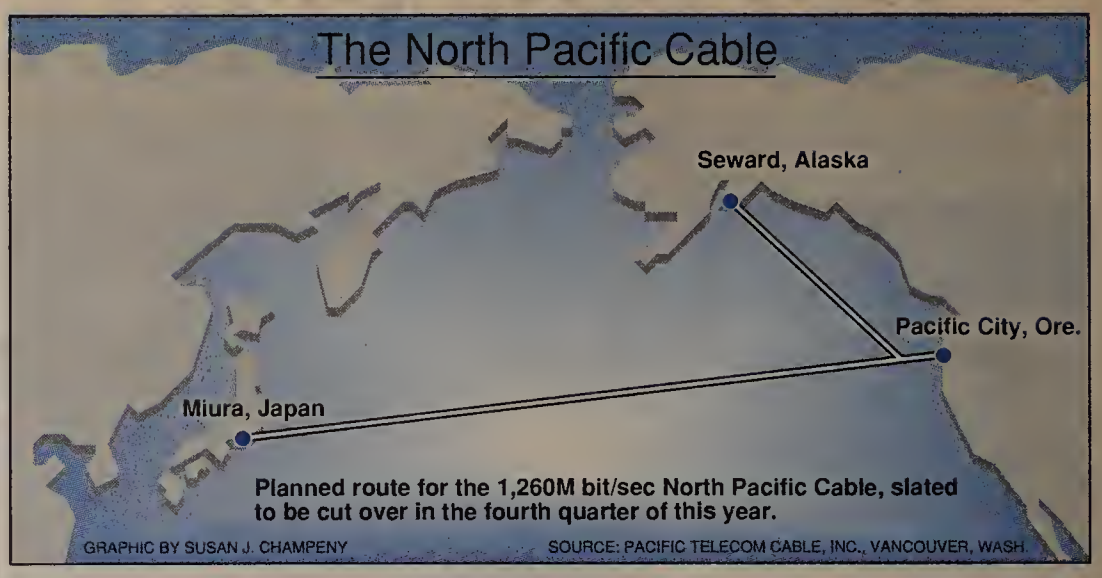
"Then we will see a situation similar to what we have in the Atlantic," where the cost of dedicated circuits between the U.S. and Europe on undersea fiber is equal to or less than the cost of satellite facilities, Tagare said.

Cost considerations aside, NPC will give U.S. users valuable circuit redundancy. With NPC operational, users will, for the first time, have fiber backup should Haw-4/TPC-3 fail.

Cut over in April, Haw-4/TPC-3 already has experienced nearly a month of outages. Some carriers are expected to lease capacity on each cable for redundancy purposes.

In marketing fiber capacity, NPC's owners are inviting users to become part owners of the facili-

(continued on page 48)



Transpacific fiber link promises options

continued from page 47

ty. Users can buy 6M bit/sec chunks of NPC, which would enable them to run four transpacific T-1 lines. This capacity would be purchased for a single up-front price, which Stephen Lovas, vice-president of marketing at Pacific Telecom Cable, Inc. based here, declined to reveal. Pacific Telecom Cable owns the American half of NPC.

Lovas said that a user buying a 6M bit/sec chunk of NPC can expect costs of as much as 50% to 60% below leasing equivalent satellite facilities. Lovas' estimate assumes service is received over the entire 25-year expected life span of the fiber link. To date, Lovas said that no users have purchased a direct ownership stake in the cable.

But the company that owns 70% of the Japanese end of NPC, Tokyo-based International Digital Communications, Inc., is nearly two-thirds owned by users, including Merrill Lynch & Co. Inc., the Industrial Bank of Japan, Ltd. and Tokyo-based C. Itoh & Co., Ltd.

"Since users are so directly involved, I expect NPC's owners will be very responsive to users' needs," Tagare said.

The other 30% of the Japanese portion of NPC is owned by London-based Cable & Wireless, PLC which supplies public network services in Hong Kong and owns the British carrier Mercury Communications, Ltd. Cable & Wireless also owns 20% of Pacific Telecom Cable. The remainder of Pacific Telecom Cable is owned by Pacific Telecom, Inc., based here, which owns Alaska's public carrier, Alascom.

Managers fill out wish list of services

continued from page 47

ownership of private, interactive VSAT nets is either not allowed or severely restricted.

Nearly 40% of the respondents said that the ability to collocate their own gear with foreign carriers was not very important.

Same applications

Lynx found that users tend to run the same kind of applications over international networks that they run on domestic nets. The most frequently mentioned application was electronic mail and messaging, with 68 users saying their international nets support the application. Sixty-six users said they run voice and remote batch applications on their international nets.

The survey also found that use of T-1 circuits is much more extensive on domestic networks than internationally. Sixty-eight of the respondents use these services domestically, while only 22 use them internationally.

Satellite monopoly may end in Canada

continued from page 47

dian satellite services, said that prices for satellite service in Canada are significantly higher than in the U.S.

Open competition could be particularly beneficial for users with transborder very small aperture terminal networks. Currently, strict limitations are placed on the number of VSAT terminals that can be placed in Canada as part of a VSAT network hubbed in the U.S. In order to have more terminals in Canada, users must build a second Canadian hub.

"This restriction greatly increases the cost of a [transborder] VSAT network," said Brian Callihoo, president of the Toronto-based Canadian Business Telecommunications Alliance (CBTA) and manager of telecommunications with the London, Ont.-based Labatt Brewing Company, Ltd.

In an open market, the requirement for a Canadian hub would likely disappear.

The CBTA has filed comments with the Department of Communications favoring open competition between U.S. satellite service providers and Telesat. In its comments, the CBTA argued that open competition would benefit Telesat by giving it a larger market in which to sell its services.

Earth station liberalization

In its paper, the CBTA also advocated eliminating restrictions on ownership of earth stations used in transborder satellite networks. Currently, users of transborder satellite networks must lease earth stations for the Canadian end from Telesat. That restriction enables Telesat to ensure that earth stations are not used to illegally obtain service from a U.S. carrier.

The CBTA said that users bypass the regulation by illegally obtaining service from U.S. satellites using earth stations licensed for domestic service. These earth stations, which are not inspected, can be owned by users. The paper suggests that users should be required to sign affidavits saying they won't use satellite dishes to illegally obtain service.

"If users are allowed to own earth stations, they will be able to have competitive bidding and get better prices," Callihoo said. "Also, you can't have true competition [between U.S. and Canadian service providers] if users are required to lease earth stations from a single supplier."

See the FAXNeT Form on Page #108

WILL YOUR COMMUNICATION SYSTEM
BE ABLE TO GROW
ALONG WITH YOUR COMPANY?

WILL YOU BE LOCKED OUT OF GLOBAL MARKETS
BECAUSE YOUR NETWORK ISN'T UP TO WORLD STANDARDS?

WILL YOU HAVE ENOUGH POWER TO DELIVER ISDN?

WILL YOU BE READY TO HANDLE VIDEO
WHEN USERS DEMAND IT?

...ssessing Meridian 1.
...it will take you confident

Get ready for the future of business — faster, more intense, more global, and more unpredictable than ever.

New Meridian 1 communication systems were designed for that future.

Designed to handle the power-hungry business applications of the '90s, like integrated voice & data, global networking, voice processing, and automatic call distribution. Designed to bring you new advancements like ISDN and fiber optics as you need them. And designed to handle your unpredictable needs for growth and new applications.

ly into the future.

Built For The Future, So You Can Plan For It Now.

Building on the best of Meridian SL-1—the best-selling PBX in the world—we've boosted every measure of system performance. We've increased traffic capacity 25%, and improved real-time capacity 15%.

What's more, our commitment to innovation continues. ISDN Basic Rate Access and more powerful applications are on the way. And we'll be delivering SONET interfaces through FiberWorld, our corporate-wide commitment to leadership in building the network of the future.

Every Meridian SL-1 And SL-100 Ever Made Can Be Upgraded To Meridian 1.

When we introduced the SL-1 in 1975, we started a trend that no one else in the industry has been able to follow. Northern Telecom owners have never had to trade to upgrade.

With Meridian 1, the commitment continues. Every one of the more than 39,000 SL-1s and SL-100s installed worldwide can be upgraded to Meridian 1. And upgrades are available right now for all SL-1 models.

New Modular Design Lets You Grow To 60,000 Lines.

Meridian 1 provides the largest growth range of any PBX. From 30 to 60,000 lines—more than twice the range of other systems. So you can add lines and features economically as the needs of your business evolve.

You expand by adding small, modular cabinets housing power, processors, storage and peripheral circuit packs.

Meridian 1 cabinets have footprints a third to a half the size of our current cabinets and they stack as you expand, for tremendous space savings.

And you'll find Meridian 1 systems the most reliable we've ever made. They're built with the most advanced manufacturing processes, and they use state-of-the-art components. So you can expect lower operating costs.

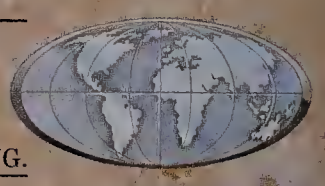
The Most Advanced Digital Telephones Of Any System.

There's a complete new array of Meridian Digital Telephones, with from 6 to 60 line and feature keys. There are special telemarketing and secure sets. A new high-performance digital attendant console. Multi-lingual displays. And dozens of ways to bring other display capabilities, line and feature configurations and data services to your users' desktops.

And, unlike many other telephones, ours work with systems of any size—30 lines or 60,000. So you'll never be stuck with sets that aren't up to new tasks and can't be migrated.

And to help you manage them all, there's new Meridian Manager, an easy-to-use, PC-based tool for station administration, traffic reporting and work order entry.

A World Leader In Global Networking.



We're making Meridian 1 hardware and software available around the world. Our global software release means you'll get new, improved software sooner, and be assured of the highest quality, too.

In addition, Meridian 1 supports all the important international communication standards like ISDN and SONET fiber optics.

How To Travel To The Future.

If you want to move into the future of business communications with confidence, Meridian 1 can take you there. Call 1-800-328-8800.

nt northern telecom

NORTHERN TELECOM

TECHNOLOGY THE WORLD CALLS ON

TO KNOW FOR SURE,
YOU'D NEED
A TIME MACHINE.

First Look

Dial-up modem operates at 14.4K

Forval America, Inc.'s Modem Division recently announced an internal dial-up modem for IBM Personal Computer ATs that operates at 14.4K bit/sec, as well as stand-alone and rack-mountable modems that operate at the same speed.

All three modems, the **IM14400s,** are manufactured by Intelligent Modem Corp. They support the evolving V.32bis standard for transmission at 14.4K bit/sec, as well as V.32 for 9.6K bit/sec transmission, V.42 error correction and V.42bis data compression, which provides a 4-to-1 data compression ratio.

V.42bis enables the modems to operate at speeds up to 57.6K bit/sec when communicating with other IM14400 modems.

The modems' software is upgradable, which protects users in the event that the final version of V.32bis is different from the modems' current implementation, said Duke DeForest, senior vice-president.

Any upgrades can be downloaded over telephone lines.

The high-speed modems are intended for intensive data transmission requirements, such as those of users with computer-aided design and manufacturing programs.

It can also be used as a fallback for 19.2K bit/sec leased-line modems, DeForest said.

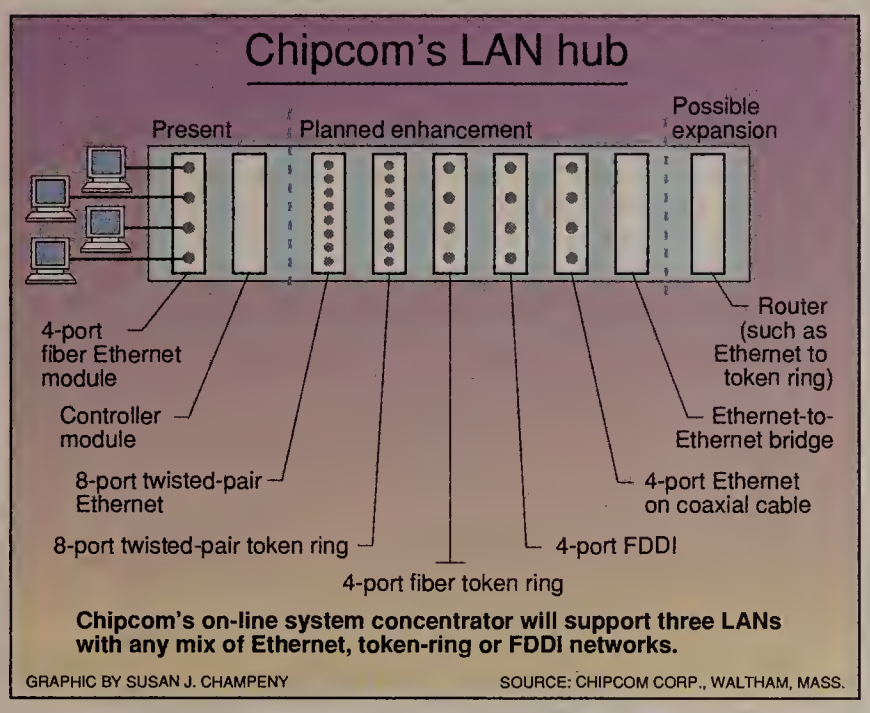
All three versions support fallback to lower speed standards, including V.22bis for 2,400 bit/sec, V.22 for 1,200 bit/sec and V.21 for 300 bit/sec.

The two-wire modems support V.54 diagnostics for loopback testing of analog and digital parameters. They support synchronous and asynchronous transmissions.

The IBM Personal Computer AT version is expected to be available in March, the stand-alone version should be available in May, and the rack-mountable version is expected to be out in July. Pricing has been set only for the AT model, which lists at $1,045 but will sell for $836 for a limited but unspecified time.

Forval America, Inc., 6985 Union Park Center, Suite 425, Midvale, Utah 84047; (801) 561-8080.

(continued on page 58)



Chipcom's on-line system concentrator will support three LANs with any mix of Ethernet, token-ring or FDDI networks.

GRAPHIC BY SUSAN J. CHAMPENY — SOURCE: CHIPCOM CORP., WALTHAM, MASS.

Chipcom's wire hub boasts support for range of LANs

Concentrator to work with E-net, token-ring, FDDI.

By Tom Smith
New Products Editor

WALTHAM, Mass. — Chipcom Corp. last week introduced a fault-tolerant local-area network hubbing device that will initially support Ethernet but eventually will support 4M and 16M bit/sec token-ring and 100M bit/sec FDDI networks.

The hub, the ONline System Concentrator, is a chassis with 17 slots. The first interface card for the hub is a fiber-optic Ethernet module. Future interfaces will support twisted-pair and fiber-optic token-rings, twisted-pair and coaxial Ethernet, Fiber Distributed Data Interface (FDDI) and Simple Network Management Protocol (SNMP)-compliant modules.

As part of its new ONline product line, Chipcom plans to introduce bridging modules and may eventually introduce routing modules that would allow, for example, Ethernet users to communicate with token-ring users, according to Frank Fuller, senior product manager at Chipcom.

The chassis has a TriChannel Architecture that will enable users to support three LANs in any combination of Ethernet, token ring and FDDI, Fuller said.

"Net managers generally don't know what's going to change in their network over the next couple years," he said. "With ONline, they can install it today and adapt [it] to their future needs."

The forthcoming twisted-pair Ethernet and token-ring cards will have eight ports each. Fiber-optic modules for all three types of LANs will have four ports, while coaxial Ethernet cards, which will allow users to daisy-chain nodes, will also likely have four ports, Fuller said.

One of the 17 slots in the chassis houses a Motorola Corp. 6805-based card that controls the chassis. The remaining 16 slots can house a maximum of 128 twisted-pair or 64 fiber connections.

The concentrators can be linked using a fiber-optic Ethernet backbone or, in the future, FDDI.

Distance limitations between the concentrator and individual

> The concentrators can be linked using a fiber-optic Ethernet backbone or, in the future, FDDI.
>
> ▲▲▲

network nodes are the same as those inherent with each type of cabling, Fuller said. With the fiber modules, for example, the limitation is approximately four kilometers.

Chipcom's TriChannel Architecture was designed with multilevel fault tolerance because it is intended to serve as a mission-critical network backbone, he said. "We think when you deal with backbones for facility networks, users need fault tolerance because it's a very vulnerable spot."

At the most basic level, the ONline concentrator has a backup power supply, and each hub can be configured to back up a second hub.

The individual fiber interface offers two levels of fault tolerance: redundancy between ports,

(continued on page 54)

WAN products mix fax, voice and data

Central switch supports devices that packetize traffic for transmission over digital facilities.

By Tom Smith
New Products Editor

BOULDER, Colo. — Republic Telcom Systems, Inc. recently introduced a packet switch that can be used with newly upgraded multiplexers to integrate packetized voice, data and facsimile traffic over wide-area digital network facilities.

The RNET voice/data packet switch supports as many as eight remote RLX Network Node multiplexers, using anything from 19.2K to 128K bit/sec links. Remote nodes supported using 128K bit/sec fractional T-1 links can be configured to support a maximum of 16 voice ports, four data ports and one fax port.

RLX Network Nodes are enhanced versions of the company's existing point-to-point multiplexers. The current products will continue to be offered for the company's installed base and users with point-to-point network requirements.

The RNET switch can be configured with one or two multiplexer interfaces, each of which supports four remote devices, according to Paul Distefano, senior vice-president of sales and marketing for Republic Telcom. The RNET switch supports a maximum bandwidth of 512K bit/sec.

The company uses its Voice Optimized Packet Exchange (VOPX) proprietary packet-switching protocol between RNET and RLX Network Nodes. VOPX uses smaller packets than X.25 and is therefore more efficient for voice transmission, Distefano said.

Along with a combination of several compression techniques, VOPX enables the multiplexers to support up to 10 voice conversations on a 64K bit/sec circuit, as opposed to typical compression techniques such as adaptive differential pulse code modulation, which provides two voice conversations per 64K bit/sec channel.

> The quality of the compressed calls is comparable to that of long-distance calls.
>
> ▲▲▲

The quality of voice calls compressed to this level is comparable to that of a regular long-distance telephone call, according to Distefano.

"We tell our [customers] that if they don't say anything to their community of users and just put the product in, they should find

(continued on page 50)

Software off-loads X.400 message routing from host

WASHINGTON, D.C. — GSI-Danet, Inc. last week introduced routing software that off-loads X.400 message handling from IBM mainframes and enables private X.400 nets to connect to public value-added nets.

The OSITEL/400 Router software, which will be demonstrated at Communication Networks '90 here this week, runs on a Unix workstation. In addition to off-loading message handling from mainframes, the software establishes connections with as many as five public electronic mail nets supporting X.400 — in effect, creating a messaging backbone between private net locations.

The primary function of the software is to off-load message relay functions from a mainframe positioned as an X.400 Message Transfer Agent, whose function is to deliver messages. This frees up processing power on the mainframe for other applications.

"OSITEL/400 Router relays messages because you don't want an expensive mainframe performing that function," said Dan Venese, X.400 product manager at GSI-Danet.

The Unix workstation is linked directly to an IBM mainframe and supports the P1 protocol used by X.400 Message Transfer Agents, Venese explained. Those agents, which are servers running X.400 software, accept incoming messages and route them to the appropriate user.

With the new software, the

(continued on page 55)

Micom Communications to unveil X.25 PAD, network control upgrade

By Tom Smith
New Products Editor

WASHINGTON, D.C. — Micom Communications Corp. this week is expected to introduce two new X.25 products at the Communication Networks '90 show here.

The products are X.25 Network Management System (XNMS) Release 2.0, an upgrade from an earlier software release, and an entry-level asynchronous X.25 packet assembler/disassembler that supports speeds up to 72K bit/sec.

XNMS 2.0 consists of an X.25 interface card for an IBM Personal Computer AT and software that lets users manage and configure Micom's line of packet switches and PADs. Those packet switches support two 72K bit/sec links at the low end and 34 153.6K bit/sec links at the high end.

Existing PADs that can be managed by XNMS 2.0 support a range of protocols, including asynchronous, bisynchronous, IBM's Systems Network Architecture and others.

For the first time, XNMS, which runs under the Xenix operating system, will allow multiple XNMS systems in different locations to manage the network, giving users the ability to have distributed rather than centralized management, according to Rick O'Dea, product manager for Micom.

Management by different people

This means that net management systems running in different time zones, for example, could be managed by different people. Users would have the ability to upload and download configuration data from one time zone or geographic zone to another to maintain a consistent data base.

Before this release, the network had to be managed by a single system at a central site, which presented problems when users wanted to manage multiple sites in differ-

(continued on page 55)

WAN products mix fax, voice and data

continued from page 49

no discernible difference," Distefano said. RNET allocates network channels on a call-by-call basis, establishing virtual connections between any pair of channels for the length of the call.

Republic Telcom Systems also offers users the option of dedicating a specific portion of their total bandwidth to data or facsimile traffic, in which case the data is not packetized.

Each trunk group in the network is identified by a user-defined, three-digit location code, which enables users to standardize on either seven- or 10-digit dialing plans for all network addresses.

RNET also provides users with tandem switching functionality. In such a configuration, it works as an intermediary between incoming voice, data or fax calls and a private branch exchange. If the call is not destined for that PBX, RNET will switch the call to its destination so the PBX does not have to handle the call.

The entire packet-switching network can be configured and managed by RNET's Network Control System (NCS), which consists of an Intel Corp. 80386-based IBM Personal System/2 or Compaq Computer Corp. microcomputer running Xenix. The hardware platform can be in the central site or linked from a remote site via a 9.6K bit/sec circuit, Distefano said.

NCS polls RNET and each RLX Network Node every 15 seconds to collect diagnostic data.

It allows for time-of-day configuration scheduling for the mix of voice, fax and data traffic on every network port.

Routing tables and network configuration data are maintained and downloaded to individual locations through NCS.

When utilized as a tandem switch, NCS can provide call detail records with information such as originating number, number called and call duration for calls that are not switched through the PBX and otherwise would not have generated reports.

NCS will also generate traffic reports, including information such as packets sent and received.

The RNET products and network management offerings are available now. The RNET packet switch costs between $45,000 and $85,000; average price of RLX Network Nodes is $19,000 to $20,000. The average price for NCS is $27,500.

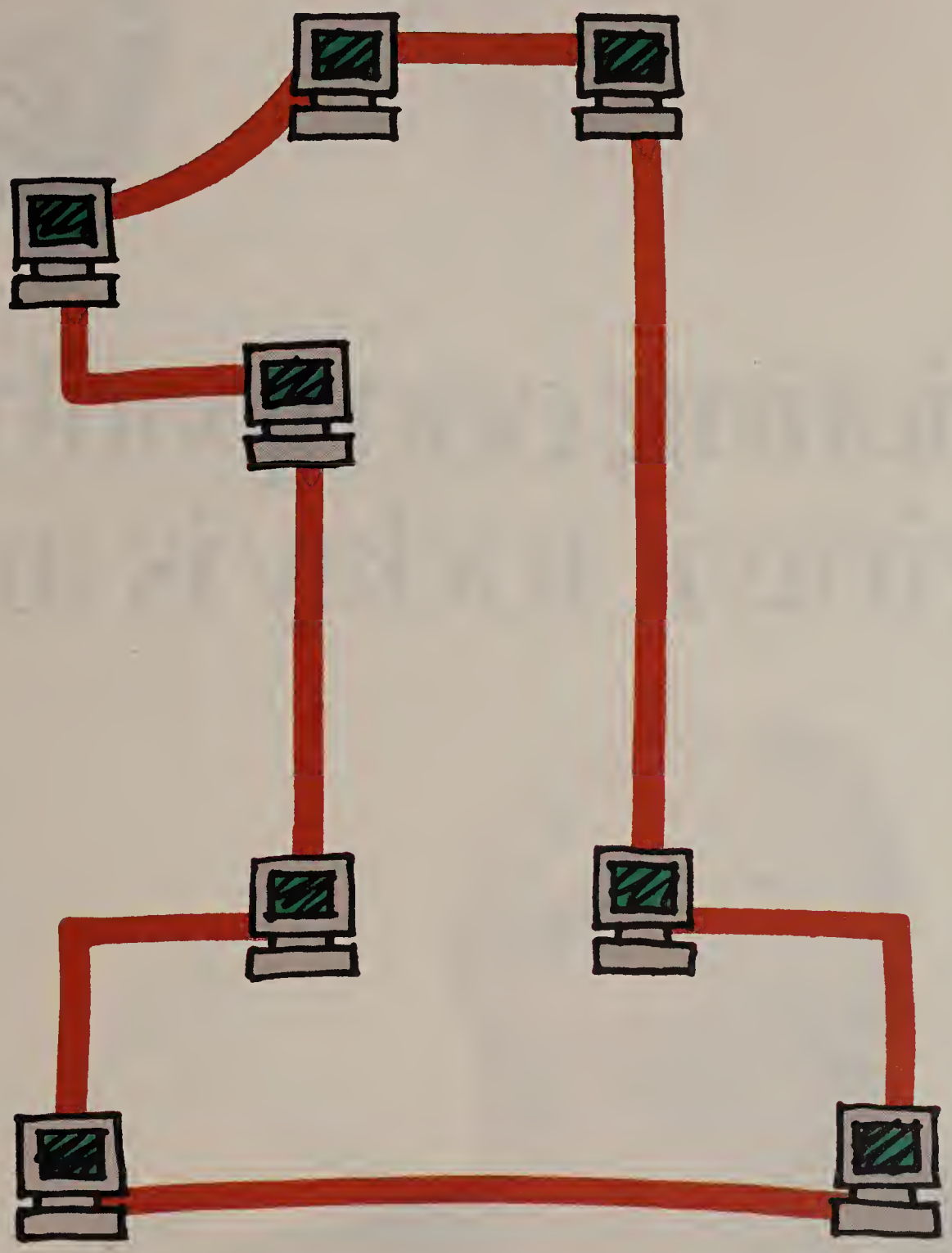
Upgrades, consisting of a new multiplexer card, are available now to current users of Republic Telcom Systems' point-to-point RLX multiplexers for $3,000.

Republic Telcom Systems can be reached by writing to 6150 Lookout Road, Boulder, Colo. 80301, or by calling (303) 530-8600.

NCS polls RNET and each RLX Network Node every 15 seconds. It allows for time-of-day configuration scheduling for the mix of voice, fax and data traffic on every network port.

▲▲▲

Using a Western Digital Networking System Can Improve Your Competitive Position.



Computers view the world a lot like business people do: Everything is either a One or a Zero. And if you're not number one, you're nothing.

So we heartily suggest that you run right out and get the right LAN. One built around our lightning fast 8 and 16-bit boards. One that makes you look as dangerous as a shark in a swimming pool to your less advanced competitors.

We give you a choice of network products. Depending on your needs. And depending on just how closely your competitors are nipping at your heels.

Choose, if you're so inclined, between our top-rated EtherCard PLUS™ products and our equally famed TokenCard™ products. Either one will make you a little bit more productive, a little bit more successful and, we suspect, a little bit cockier the next time you run into one of your rivals.

THE LAN FORMS HERE

No matter which one you opt for, you're guaranteed awesome speed, and as logic would dictate, higher throughput than with any other boards you may wish to risk your future with.

Naturally, all Western Digital EtherCard PLUS and TokenCard products are compatible with Novell NetWare. And just as naturally, they work oh-so-fast in all other environments, too.

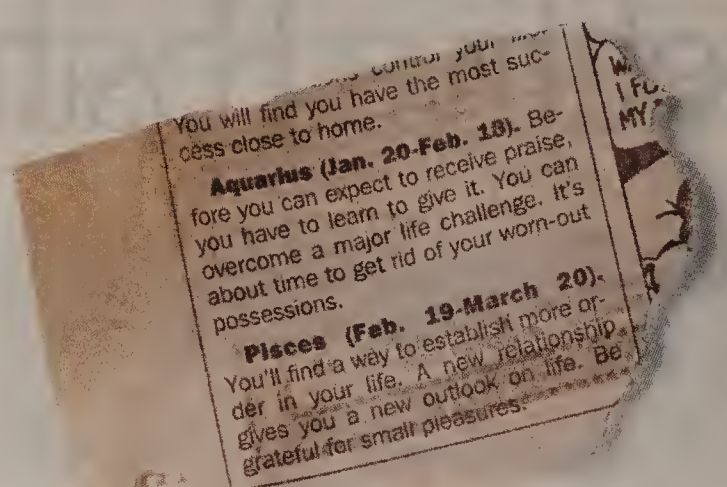
So if you're looking for value in network boards, visit your nearest dealer and utter the words, "Western Digital."

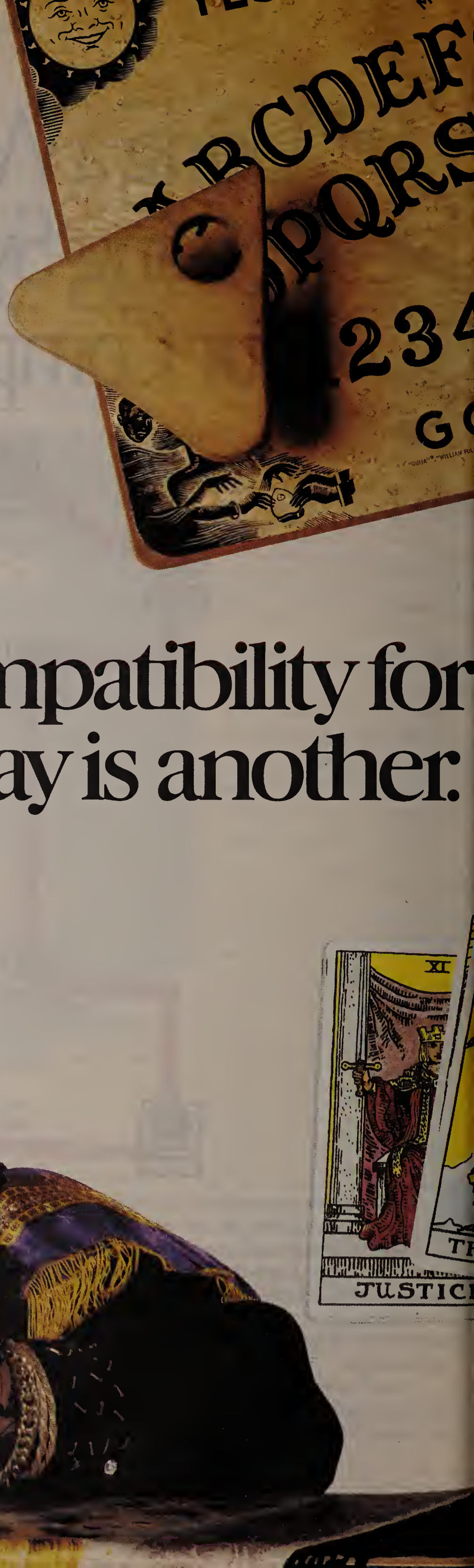
And remember, the digit in Western Digital is number one.

WESTERN DIGITAL

Semiconductors—Storage—Imaging—Communications

See the FAXNeT Form on Page #108





Predicting compatibility for Delivering it today is another.

the future is one thing.

The new COMSPHERE™ 6800 Series Network Management Systems link AT&T and Paradyne products.

You don't have to wonder about compatibility with the new AT&T Paradyne COMSPHERE 6800 Series Network Management Systems. They support AT&T DATAPHONE® II, Paradyne and the new AT&T Paradyne COMSPHERE family of products. So you can manage a wide range of data communications equipment—analog, digital and T1—from a single point. They're also compatible with AT&T ACCUMASTER™ Integrator for voice and data integration.

The 6800 Series NMS can manage your analog network no matter what your mix of old or new AT&T Paradyne modems. That's because the new COMSPHERE 3400 and 4400 Series modems can be programmed to be compatible with the original Paradyne 3400, DATAPHONE II or our new Advanced Diagnostic Protocol. These new modems even interface with IBM's NetView™ via an SNA™ compatibility feature.

But the 6800 Series NMS and the COMSPHERE family don't just provide compatibility today, they'll deliver it tomorrow as well. This state-of-the-art communications platform allows you to integrate new products into your network easier than ever before.

The foundation to this capability is the new COMSPHERE 4000 Series, an intelligent communications carrier. Using a unique bus architecture, the 4000 Series insures compatibility with existing as well as new products and network services as they are introduced. It also provides the highest configuration density in the market, housing, for example, up to 16 modems and 16 multiplexers.

So it's no mystery what the future holds with AT&T Paradyne data communications systems. Compatibility, flexibility and investment protection.

For more information, contact your AT&T Paradyne Account Executive or call **1 800 482-3333, Ext. 303.** In Canada, call **(416) 494-0453.**

AT&T Paradyne

See the FAXNeT Form on Page #108

Heritage Communications unveils 3270 board with DFT, CUT modes

By Tom Smith
New Products Editor

Heritage Communication Systems, Inc. (HCSI) recently announced an IBM 3270 emulation board and software that enables users to establish terminal-emulation sessions to access an IBM host.

The product — known as the 3270 Platform Series — consists of HCS78 Plus, HCSI's IBM 3278/79 terminal-emulation software, and one of three half-slot adapter cards for personal computers, Personal System/2s based on Micro Channel Architecture or Toshiba Corp. laptops.

The terminal-emulation boards are outfitted with a BNC connector that enables them to be cabled directly to an IBM 3174, 3274 or 47XX cluster controller. They run in either Control Unit Terminal (CUT) or Distributed Function Terminal (DFT) modes. CUT mode supports a single host session, while DFT supports as many as five sessions on a combination of displays and printers, depending on the software.

The card has an on-board microprocessor, the Chips and Technologies, Inc. C570, that handles the 3270 protocol independently of the personal computer processor, freeing up memory for application processing. Users can hot-key between emulation and personal computer modes.

HCS78 Plus software has a resident file-transfer capability that provides personal computer-to-mainframe and personal computer-to-personal computer file transfer. That file-transfer program includes batch processing functions, automatic connection to and disconnection from the host and detailed processing reports.

The product supports the High Level Language Application Program Interface (HLLAPI) in IBM's 3278/3279 terminal-emulation product, as well as application program interfaces (API) in Digital Communications Associates, Inc.'s (DCA) Irma board. Its support for IBM and DCA hardware and software allows terminal users to migrate to personal computers without requiring application programs to be rewritten or users to be retrained, according to HCSI. In addition, Irma users will be able to migrate to IBM's 3278/79 emulator and HLLAPI without forfeiting applications written for the Irma interface.

Support for IBM's HLLAPI assures that HCSI's emulator will be compatible with IBM's evolving Systems Application Architecture, a set of interfaces and protocols that can be used to develop applications that operate across IBM's line of processors, according to Chuck Salvato, president of HCSI.

The 3270 Platform Series does not require mainframe data to be translated at the personal computer, as required by other APIs, Salvato said.

The 3270 Platform Series is available now. Personal computer, PS/2 and laptop boards cost $399 each, while HCS78 Plus, which requires IBM PC-DOS Version 3 or above, costs $129.

HCSI can be reached by writing to 1 W. Deer Valley Road, Suite 104, Phoenix, Ariz. 85027, or by calling (602) 780-1497.

Chipcom hub boasts support for LANs

continued from page 49

allowing traffic on a failed port to be switched to another, or through a fault-tolerant fiber transceiver for any node regarded as critical. In the latter case, redundant links have to be run from the node to the concentrator.

In addition to being able to implement fault-tolerant capabilities manually using dip switches, users will be able to configure their networks for fault tolerance using hub network management modules when they become available.

Customers will be able to use an ASCII terminal to tap these modules through an RS-232 port and, later, from a Unix workstation. Both versions of the net management capability will be SNMP-compliant, but the Unix workstation version will offer greater functionality.

An ASCII terminal will provide snapshots of network performance data, such as packets transmitted at specific times, as well as fault and configuration management. The Unix-based workstation, by contrast, will give users a graphical user interface and storage capabilities that will enable them to develop historical performance reports and process related data.

The Unix-based net management system will also support X/Windows and an integrated SQL data base.

Fuller said the company plans to offer an Ethernet-to-Ethernet bridging capability sometime later in 1990, though he did not give a specific date. Routing modules are a possibility, he added, although there are no specific plans to develop them at this time.

Initial ONline product offerings will be available in April. The ONline System Concentrator costs $4,450. The four-port ONline Ethernet Fiber Module is priced at $1,800, and the Fault Tolerant Fiber Transceiver costs $995.

ASCII terminal-based net management will be offered in the second quarter and Unix workstation-based management in the third quarter. Pricing has not been set.

Chipcom can be reached by writing to 195 Bear Hill Road, Waltham, Mass. 02154, or by calling (617) 890-6844.

Micom to unveil X.25 PAD, net control

continued from page 50

ent geographic areas and time zones.

The XNMS software also supports two X.25 trunks at speeds up to 72K bit/sec on the X.25 interface card, which provides redundancy if one link fails. The earlier release could support a maximum speed of 19.2K bit/sec on a single circuit.

For the first time, XNMS 2.0 supports a remote console, either an ASCII or color terminal, via an asynchronous dial-up modem at speeds up to 9.6K bit/sec.

Other enhancements to the system, which uses in-band X.29 signaling for management, include support for up to 500 nodes, compared to the earlier release's support for 250 nodes, and the ability to alert net administrators with pagers when an alarm is generated. The user interface is now mouse-driven, compared to the earlier release, which was command-driven, O'Dea said.

XNMS 2.0 is scheduled to be available in mid-March for $15,000.

Entry-level PAD

The company's entry-level asynchronous LX-PAD complements two existing asynchronous PADs: the MB2-XAP, which supports 16 channels to a single X.25 link at speeds up to 14.4K bit/sec; and the MB3-XAP, which supports 22 channels to two X.25 links at speeds up to 72K bit/sec each.

The LX-PAD offers users eight channels at a composite link speed of 19.2K bit/sec. It offers the same basic functionality as the MB2-XAP at a higher speed. Based on customer demand, it could eventually replace the MB2-XAP, according to Joanie Reuben, marketing manager for the company.

> The LX-PAD offers users eight channels at a composite link speed of 19.2K bit/sec.
>
> ▲▲▲

LX-PAD can be managed by XNMS or by Micom's X.25 Control Center-Plus, a net management system that runs on a DOS-based Personal Computer and is targeted for networks with between 50 and 100 nodes.

LX-PAD generates call accounting statistics, such as billing information, calling number, call recipient and call duration, as well as performance statistics such as packets transmitted and received.

The new PAD is scheduled for availability in April. Pricing for a four-channel configuration is expected to start at $1,350, whereas a four-channel configuration of the MB2-XAP costs $1,840.

Micom can be reached in writing at 4100 Los Angeles Drive, Simi Valley, Calif. 93063, or by calling (805) 583-8600.

Software off-loads X.400 routing

continued from page 49

mainframe passes all messages it receives to the OSITEL/400 Router, which then relays them to the correct Message Transfer Agent. The Message Transfer Agent then forwards the messages to their recipients.

Going public

A user in a private X.400 network running OSITEL/400 can connect with up to five public value-added networks, such as those operated by AT&T, MCI Communications Corp., BT Tymnet, Inc. or Infonet Services Corp.

Few, if any, competing products support as many connections to public service providers, Venese said.

Support for multiple connections enables a single Message Transfer Agent to have five physical connections, for example, to MCI's MCI Mail, providing redundant links in case of failure.

> A user in a private X.400 network running OSITEL/400 can connect with up to five public value-added networks, such as those operated by AT&T, MCI and BT Tymnet.
>
> ▲▲▲

A single Message Transfer Agent could also connect to several different public nets, which would be beneficial at times such as the recent AT&T network failure. Connections to several networks could prevent a user from losing all communications capabilities because it would be able to reroute traffic to another net.

OSITEL/400 Router contains a relational data base for storing routing tables used to select traffic routes based on cost, route availability and network congestion.

The software also supports specialized billing functions so that individual users can be billed for their usage.

OSITEL/400 Router is available immediately. The cost of end-user licensing starts at $5,000, depending on the size of the workstation on which the software runs.

GSI-Danet can be reached by writing to 1831 Wiehle Ave., Suite 100, Reston, Va. 22090, or by calling (703) 471-7130.

WE'RE THE T1 VENDOR WITH TOTAL NETWORK SOLUTIONS.

It may not be common knowledge, but Codex has been connected with T1 and other digital technologies almost as long as T1 has been connecting information centers.

In fact, Codex was one of the first to see the cost and availability advantages of fast packet technology for T1 networks.

But no T1 network can stand alone. It has to be part of a complete network solution. And there's no T1 vendor better at total network solutions than Codex.

We have 27 years' experience designing, installing and supporting multi-technology networks in 44 countries worldwide. Including more T1 fast packet networks than anyone else.

Which explains why we can offer the best solution for integrating T1 into your current information systems environment.

If you'd like to learn more about our T1 capabilities, call us at 1-800-426-1212 ext. 7232. We'll send you a free copy of our "Applications Booklet of T1 Fast Packet Technology." It's the first step in finding out what our experience can do for you.

codex | THE NETWORKING EDGE

MOTOROLA

"I DIDN'T CODEX D

See the FAXNeT Form on Page #108

First Look

continued from page 49

Reuters software tracks aviation industry

Reuters America, Inc. recently announced software that gives users asynchronous dial-up access to an on-line data base of financial and traffic statistics about the aviation industry.

Reuter Aviation Link, a software product for IBM Personal Computers, provides information such as schedules, balance sheets, statements of operations, aircraft operating expenses and airport traffic statistics.

The information source for Aviation Link is the U.S. Department of Transportation's Form 41 aviation data, which includes detailed financial and traffic statistics filed regularly by certified airlines. Information is updated daily with Form 41 statistics dating back to 1968.

The software will help airlines analyze their operations and those of their competitors. Aircraft manufacturers can use the software to develop client profiles and identify sales opportunities. Aircraft leasing firms could use the product to evaluate maintenance expenses by aircraft type.

Airports can use the service to identify passenger and cargo trends, while government agencies can use the package to monitor the aviation industry.

The software automatically signs users onto Reuters' private packet-switching network via an asynchronous modem at speeds up to 2,400 bit/sec. The data base, which is located in Toronto, will download the requested information in the format selected by the user.

Reuter Aviation Link software, including a year of updates and corrections, is available now for $200; thereafter, users must pay a $100 annual fee to keep the software up-to-date. Users must have DOS 2.2 or above to run the software.

Reuters America, Inc., 1700 Broadway, New York, N.Y. 10019; (212) 603-3300.

AppleTalk file-sharing package now supports E-mail

Shiva Corp. recently upgraded its DOS Dial-In software — which enables remote personal computers to access Apple Computer, Inc.'s AppleTalk networks — to support AppleTalk electronic mail.

In **DOS Dial-In Version 1.01,** Shiva added support for Microsoft Corp.'s Microsoft Mail PC, CE Software's QuickMail PC and the TOPS Division of Sun Microsystems, Inc.'s InBox PC, allowing personal computers running those packages to send and receive E-mail with AppleTalk networks.

Shiva said the DOS Dial-In product, offered since September 1989, was initially developed for users with remote personal computers that needed to share files with a remote AppleTalk network. The product has been upgraded with E-mail support to give these users increased functionality and productivity.

DOS Dial-In Version 1.01 also supports TOPS DOS 3.0, the latest version of TOPS' peer-to-peer AppleTalk file-sharing system.

Like its predecessor, DOS Dial-In Version 1.01 lets a remote personal computer access an AppleTalk network through a 2,400 bit/sec Shiva NetModem; NetSerial, a gateway that allows AppleTalk users to share serial devices; TeleBridge, a remote AppleTalk bridge; or EtherGate, a gateway supporting Apple's EtherTalk and LocalTalk protocols.

DOS Dial-In Version 1.01, which costs $99, is available now. Current DOS Dial-In users can obtain free upgrades by calling (800) 458-3550 between 9 a.m. and 5 p.m. Eastern Standard Time.

Shiva Corp., 155 Second St., Cambridge, Mass. 02141; (617) 864-8500.

LP Com unit unveils analyzer that tracks net performance

Tektronix, Inc. LP Com Division last month became one of the latest companies to introduce a low-priced network diagnostics system.

The **Network Performance Analyzer (NPA)** monitors and reports response time, network performance, network utilization and threshold conditions.

According to the company, the NPA features a unique troubleshooting table that enables nontechnical operators to diagnose network problems.

The NPA is available as a portable, single-function TC 1000 test unit; as an add-on module to Tektronix's TC 2000 multifunction test system; or as a board-only subsystem that plugs into a DOS-based personal computer with at least 640K bytes of memory and a 10M-byte hard disk.

There are two versions: the NPA1, which can analyze a single line operating at a maximum speed of 9.6K bit/sec, and the NPA2, which can analyze as many as 10 lines operating at speeds of up to 64K bit/sec.

Both include a macro facility that lets users create their own automatic test sequences, as well as store and print the results in a data base format of their choice.

Pricing

The NPA1 and NPA2 are available now. The TC 1000 configuration is priced at $6,000 for the NPA1 and $6,500 for the NPA2.

The TC 2000 and subsystem options are each $2,000 for the NPA1 and $3,500 for the NPA2.

Tektronix, Inc. LP Com Division, 205 Ravendale Drive, Mountain View, Calif. 94043; (415) 967-5400.

See the FAXNeT Form on Page #108

TCP/IP for NetWare:

STOP THROWING AWAY BOARDS AND MONEY TO GET IT.

Only Racal InterLan lets any Novell user access any TCP host.

And provides ORACLE SQL*NET support.

At one-fourth the cost.

Now you can NetWare to anywhere, via the unique TCP Gateway. Only from Racal InterLan. Thousands of Gateways are enabling over 100,000 NetWare users to access SUN workstations, UNIX machines, VAXs, IBM mainframes, and more.

And Racal InterLan's unique, user-proven TCP Gateway lets them do it without replacing network adapters. At one-fourth the cost of other, narrowly limited solutions.

Only the TCP Gateway provides connectivity from any Novell NetWare subnet: Token Ring. Ethernet. ARCnet. ProNET. You name it. Just plug the TCP Gateway card and software into your Novell server, and any TCP/IP host is within easy reach. So is support for ORACLE's SQL*NET.

Compare Versatility, Cost-Effectiveness.

	TCP Gateway	Brand "Ex"
Cost per node	$250	$1000+
Adapter choices	Any Novell network.	Ethernet only.

There's still more to the Gateway's versatility. You get TELNET terminal emulation. Reliable FTP file transfer. SMTP E-mail. Even a Sockets Library.

If you can't afford to throw away boards—and money—you can't afford to be without Racal InterLan's TCP Gateway.

Call 1-800-LAN TALK for complete details, and the name of your nearest Racal InterLan sales location.

Racal InterLan *One Source Interoperability*

155 Swanson Road, Boxborough
Massachusetts. 508 263-9929.
GSA pricing available.

RACAL

Now With ORACLE SQL*NET Support!

OPINIONS

INFORMATION TECHNOLOGY

BY JAMES KOBIELUS

The threefold path to cost management

Why are information technology costs so difficult to manage? Because most users and information technology professionals are penny-wise and pound-foolish. Like shoppers who'll buy any sale item, regardless of whether it's needed, companies tend to acquire more technology than they can fully justify — which is why information technology costs are often a sitting duck for the firm's budget chopper. To the average business manager, these costs are a big, juicy overhead item ripe for the ax.

For information technology professionals, holding onto their budgets and pet projects in times of corporate austerity means proving to the financial folk that they can indeed manage their own costs. Sadly, fiscal restraint is not a virtue associated with system professionals. Most are too busy building and tweaking their networks to pay attention to the bottom line.

> Sadly, fiscal restraint is not a virtue associated with system professionals.
>
> ▲▲▲

Perhaps these information technology professionals would take cost management more seriously if they viewed it as a spiritual quest with a threefold path to fulfillment, involving self-knowledge, self-restraint and self-sufficiency.

■ **Self-knowledge.** Few information technology professionals have a clue as to how their systems affect their companies' cost strucures. The first step in any cost control effort is to set up cost-accounting and management reporting systems that measure the important quantities and relationships: hardware, software, production, development, training, non-information systems (IS) costs and work disruption. This data should be collected regularly and made available to senior business and information technology decision makers.

■ **Self-restraint.** People who work with technology tend to view silicon-encrusted circuitry as the answer to all business problems. As a result, many have long shopping lists and tend to run amok when given control over the corporate purse strings. To check the overacquisitive technologist, require formal business justifications for major acquisitions and systems development efforts. Or require that less expensive off-the-shelf options be explored before considering custom-built systems. (This option will meet fierce opposition from those information technology artisans whose professional pride comes from handcrafting every component of every system.)

■ **Self-sufficiency.** There is a mother lode of hidden assets in the IS and telecommunications operations of most user companies. Some companies use only a bare fraction of the potential of their technical staff and computer and communications systems.

The impatience and volatility of the high-technology world often relegates productive assets to the scrap heap before they have had a chance to make a contribution. Capitalizing on hidden technical and human assets requires a commitment to using and reusing what's already in place.

But don't be fooled — there's nothing glamorous about watching nickels. And there's always the risk of acquiring a bean-counter mentality, diverting systems development efforts from their proper focus on strategic business advantage.

Still, the ability to manage costs is a sign of corporate maturity. Without it, IS and telecommunications professionals will never be accepted as full business partners in their companies.

Kobielus consults on information technology in Alexandria, Va.

NETWORK WORLD
The Newsweekly of User Networking Strategies

Editor
John Gallant

Executive Editor
John Dix

Assistant Managing Editor — News
Charles Bruno

Senior Editors
Industry Update — Bob Brown
Data Communications — Jim Brown
International Networking — Barton Crockett
Local Networking — Laura DiDio
Telecommunications — Bob Wallace

Senior Writers
Paul Desmond
Management Strategies — Wayne Eckerson

Staff Writer
Joe Panepinto

New Products Editor
Tom Smith

Assistant to the Editor
Cheryl Tynan

Network World
161 Worcester Road
Framingham, Mass. 01701
(508) 875-6400
MCI Mail — 390-4868

An IDG Communications Publication

Assistant Managing Editor — Production
Beth Khoury

Associate Editor
Joanne Cummings

Copy Editors
Liz Pappas
Michelle Beaulieu
Karen Maierhofer

West Coast Bureau
501 Second Street, Suite 600
San Francisco, Calif. 94107
(415) 978-3160

Bureau Chief
Susan Breidenbach

West Coast Correspondent
Walter Sweet

Washington, D.C. Bureau
650 National Press Building
529 14th Street NW
Washington, D.C. 20045

Bureau Chief
Anita Taff
(202) 347-6184

Features Editor
Steve Moore

Associate Features Editor
Bruce Guptill

Features Writer
Salvatore Salamone

Assistant Features Editors
Alison Conliffe
Susan Collins

Art Director
Dianne Barrett

Informational Graphics Designer
Susan Champeny

Junior Graphic Designer
Susan Slater

Contributing Editors
Daniel Briere
James Kobielus
Joe Mohen
Alan Pearce

Editorial Assistant
Tracie Seder

President/Publisher
Gary J. Beach

Director of Financial Operations
Mary Fanning

EDITORIAL

Net intrusion is a crime and violators should be punished

Now that Robert Morris has been convicted of violating the federal Computer Fraud and Abuse Act, observers are debating whether he merits a severe penalty for his actions or whether the conviction alone sends a strong enough warning to other would-be net breakers.

There is no debate.

Morris should be given a stiff sentence for violating a much-needed law designed to protect the integrity of the computers and networks that play such an important role in our society and economy. (Morris faces up to five years in prison and a maximum fine of $250,000.)

To let him off with anything less than a hefty fine would be a disservice to all rely on computer networks, which includes almost everyone today.

In November 1988, Morris sent a worm program scurrying through the nationwide Internet, knocking out dozens of computers at universities and government agencies for hours.

Now that Morris must pay the piper, some are urging restraint in sentencing. Why?

For one thing, they claim a severe punishment could actually exacerbate the problem of net intrusion. Upping the ante, they argue, would increase the challenge for thrill-seeking hackers.

Perhaps that's true. But imagine the chaos that would ensue if society were to apply that same principle to other crimes. Are we increasing the thrill for drug dealers by imposing stiff penalties on them?

Some say Morris shouldn't be punished because he didn't intend to cause such disruption. One of his friends was quoted as saying that Morris' actions were "an intellectual experiment."

Since when is this a defense for criminal behavior? What would happen if it were extended to other areas of the law? Should the captain of the Exxon Valdez be let off because he didn't intend for his negligence to result in the destruction of hundreds of miles of the Alaskan coastline? Certainly not.

Other observers have even praised Morris, saying he made users more conscious of security and more responsible in protecting their computers and networks. One even had the audacity to state that users are as guilty as Morris because they left their systems unprotected.

Again, let's carry that logic into other realms. Should we offer leniency to the burglar who robs your home after you left the door unlocked? You'll be more security-conscious, but the guilt of the criminal is not diminished.

Those who favor leniency for Morris say that people like him have helped advance security technology by making us deal with emerging high-tech threats such as viruses. Perhaps that praise should be extended to cat burglars, safecrackers, auto thieves and others whose tireless criminal efforts have helped push the state of the art in physical security systems.

Thanks, but no thanks. We're happy to leave the job of expanding our security knowledge to legitimate researchers in the field.

It's time the courts made it crystal clear that hacking and network intrusion are not amusing pastimes for the technologically literate. Networks are the lifeblood of many businesses today. They're not a proving ground for hackers seeking to show off their skills or demonstrate their computer prowess.

Morris chose to challenge the law and, in doing so, took the risk of punishment. As one juror said, "He did what he did, and he knew what he was doing."

The court must show that we are serious about protecting computer networks — as serious as we are about protecting the integrity of the other vital mechanisms on which our economy relies. It should chill this counterproductive enterprise by showing that we won't tolerate people playing with our businesses or vital research and communications systems.

Unless we make it painfully evident that network intrusions won't be tolerated, this kind of behavior will continue to feed on itself. Next time, it may be your network that comes to a grinding halt. And next time, it is possible that the network won't just stop running; valuable information may be destroyed.

OPINIONS

NETWORK MANAGEMENT

BY JAMES HERMAN

Distributed processing demands remote management ability

Unlocking the potential of low-cost distributed processing will require effective monitoring and control of dispersed networks, servers and applications. But if decentralization of processing and storage implies decentralization of support, administration and troubleshooting, then users may find that the overall cost of this new approach skyrockets, while quality of service declines. Quality control concerns will definitely plague adoption of distributed application models.

There are already signs that as interconnected local-area network architectures become more complex, they also become more unreliable. With expanding the scope of networks comes increased exposure to disruptions and viruses. Distributed processing won't get off the ground if we don't solve the problem of management and control of these new systems.

Remote management technology is necessary to give experts instantaneous access to accurate information about performance and capacity, failures and errors, parameter settings and version numbers, previous faults and recent changes. To link our distributed resources over networks in a manageable way, users must be able to examine how the end-to-end information system, or any cross-section of it, is functioning.

Remote management does not imply fully centralized management. Different groups may be responsible for different subsystems or layers of the problem. A central group may operate the basic network infrastructure of circuits, switches, routers and major gateways. Many other groups may be responsible for managing computers or applications. Most important, however, is the ability to locate the management function anywhere in the enterprise — remote from the elements being managed.

Thus, the widespread adoption of applications that depend on the services of multiple computers and many interconnected networks requires that the distributed systems management problem be solved.

The minimal outline of a solution includes the following:

- All elements in the enterprise must be instrumented to report basic management information to authorized management applications.
- This management information must be able to reach any management application in the enterprise. It might even have to be sent outside the enterprise, as in the case of third-party management services or management of interenterprise applications.
- A large body of management application software must be available to process this management information efficiently, since the scale and complexity of these distributed systems will require easy-to-use, highly automated tools.

We are far from solving these problems. Most of the new client/server technology is poorly instrumented and often can be monitored and controlled only by a local operator. Only now are we beginning to be able to access management functions for LANs across a bridge or router boundary. Today, troubleshooting most LAN problems involves going to the impaired site and plugging an analyzer into the problem LAN cable.

Moreover, the problem could get much worse. The continued trend toward downsizing application platforms carries with it a concomitant rise in the number of intelligent, manageable entities in a network. In the networks of the early 1980s, when most users were on dumb terminals, there were perhaps a dozen users represented on the net by a single intelligent node.

The distributed internets of the 1990s will have more than one intelligent node per user, when you include the user's personal computer or workstation and the servers supporting them. Also, the number of users will climb steadily as information technology penetrates new areas of the organization.

If you can't measure it . . .

There are signs of the emergence of a new generation of net management architectures that will make solving these problems possible. Despite such progress, however, the real obstacle to effective management of tomorrow's information systems will remain the lack of basic instrumentation for remote management in our hardware and software. If you can't measure it, you can't manage it.

Yet, few developers think about the manageability issues during initial design, and few are tuned into the idea of remote management. They concentrate on new functionality, not mundane maintenance problems. Remote management capability must be built into all layers of information technology: physical media, storage and processors, generic protocols, operating systems, data base management systems and specific application software.

These new functions require more than mere reporting of state variables. They require the definition of fault isolation tests to determine which components are working. The instrumentation of system software must be done with attention to its effect on overall performance. Multiple levels of detail with remote control over depth and scope of reporting will be needed. These are not trivial design issues.

Software and hardware designers throughout the industry must build remote management into their new products. Eventually, everything will be on the network and everything should be able to be managed over the network.

Herman writes, teaches and consults on telecommunications technology with Northeast Consulting Resources, Inc., a Boston-based consulting collaborative specializing in management, communications and information strategies.

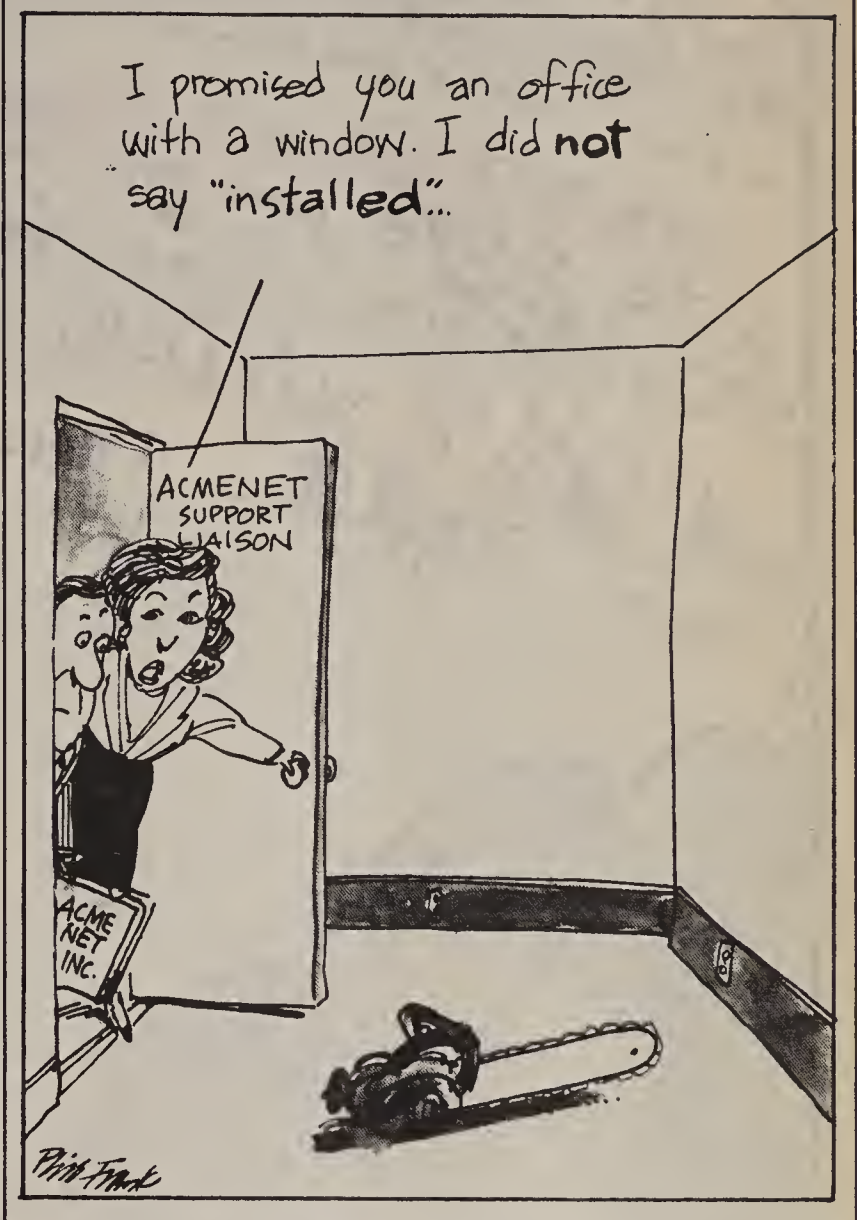
TO WRITE, OR NOT TO WRITE: That is the question. Has your network suffered outrageous fortune's slings and arrows? Take arms against your sea of troubles by writing an opinion column.

Manuscripts should be letter-quality, double-spaced and between 600 and 900 words in length. Disk or modem submissions are preferred.

If you'd like to write a column, call Steve Moore, features editor, at (508) 820-7439, or fax your idea to us at (508) 820-3467.

TELETOONS

BY FRANK AND TROISE



LETTERS

Clarifying OSIone's goals

The article "Who's who in standards" (*NW*, Dec. 25, 1989/Jan. 1, 1990) provided information on numerous organizations established to advance industry standards. However, the article's description of OSIone wasn't quite correct. I would like to try to provide a more accurate picture of OSIone and its goals.

Three mistakes were made in the description: OSITOP, a European user-oriented OSI association, is not a member of OSIone; EurOSInet is a member but was missing from the list; and the five regional groups will *not* be combined into a single organization in 1990.

OSIone is an international forum organized to test and demonstrate interoperability of Open Systems Interconnection products on a worldwide basis. OSIone consists of EurOSInet (Europe), INTAPnet (Japan), OSIcom (Australia), OSINET (U.S.) and OSNET (Singapore). Each regional organization consists of both vendors and users.

OSIone aims to:

- Enable regional OSI network groups to cooperate on a global basis while retaining autonomy in their respective regions.
- Promote OSI through demonstrations and other specific activities.
- Use harmonized functional standards of OSI as the basis for demonstrations.

At its meeting in Sydney, Australia, last June, OSIone announced it will use one set of interoperability tests for File Transfer, Access and Management and for X.400 — those originally defined by OSINET. Interoperability tests for other OSI protocols are future candidates.

John Dempsey
Vice-chairman
OSINET Technical Committee
Unisys Defense Systems
Camarillo, Calif.

(More letters, page 105)

Network World *welcomes letters from its readers.*

Letters should be typed, double-spaced and sent to Editor, Network World, *161 Worcester Road, Box 9172, Framingham, Mass. 01701.*

Letters may be edited for space and clarity.


A.15 = 0.999
DATA BIT 3
1 MB SIMMS
HUMAN INTERFACE GUIDELINES
1990
©1989
ACK/GER/G/GND
DB-19
GND
DATA
HARD
DATA BUS

Communications in the boonies

Rural areas can offer companies cheaper operating costs, cleaner living and, sometimes, communications headaches.

Whatever their reasons for leaving behind the cities and the suburbs, — because the air is cleaner, business costs are cheaper or employees will have a better quality of life — companies setting up data communications operations in remote areas "can probably get most of what they need, but they may have to pay extra for it," says Donald Dillman, professor of rural sociology at Washington State University in Pullman.

Paradoxically, settling in an area served by a small independent telephone company may be a better business move than moving to a location serviced by a regional Bell holding company or another large provider.

Due to a combination of cross-subsidization, local responsiveness to local needs and relative regulatory freedom, these independents can often provide at least the levels of service associated with larger metropolitan carriers. Sometimes, they are even able to skip a generation in central office evolution, leaping from crossbar to digital technology with nothing in between.

As an example: Siskiyou Telephone Co. of Fort Jones, Calif., which serves 3,400 access lines over 2,258 square miles in northwest California, has been all digital since 1984. Neither Pacific Bell nor GTE Corp. can make that claim.

The 93-year-old company pioneered the use of solar-powered portable digital microwave stations for forest fire fighting in California's Klamath National Forest. In addition, Siskiyou Telephone this year plans to replace hand-cranked magneto farmer lines with solar-powered ones.

Volcano Telephone Co., another tiny independent, serves Volcano, Calif., a community about 50 miles from Lake Tahoe. It has offered international direct long-distance since the mid-1970s — something still not available in Sacramento, Calif. — and offers enhanced 911 services not available in the neighboring Amador county seat of Jackson, Calif., served by Pacific Bell.

According to Steve Sazegari, senior telecommunications analyst at Dataquest, Inc., a San Jose, Calif.-based market research firm, 15% to 20% of all U.S. corporate moves are to locations outside major metropolitan areas. Of those, 1% to 2% are in truly rural locations. One-third of La Jolla, Calif.-based Computer Intelligence's data base of U.S. computer and communications users includes businesses outside major metropolitan areas.

While the size of the rural communications market is difficult to track, John Mahoney of Northern Telecom, Inc. estimates that more than 12 million access lines are served by independent local exchange carriers, which are likely to be servicing the most rural areas. More than half of this market belongs to General Telephone Co. of Thousand Oaks, Calif., according to Mahoney, who is vice-president of strategic sales for integrated network systems at Northern Telecom, based in Research Triangle Park, N.C.

Northern Telecom has had a historic interest in serving the 1,450-vendor independent tele-

(continued on page 64)

Borsook is a free-lance writer based in Tucson, Ariz.

By PAULINA BORSOOK

(continued from page 63)
phone company market. When the Canada-based company came to the U.S. to market its products, what was then the Bell System was served by Western Electric, but no one firm had a lock on the non-Bell market.

With this in mind, in 1974, Northern Telecom specifically designed the DMS-10 to serve rural communications users' needs. The DMS-10 had then-novel features such as built-in billing functions and pair gain, which made T-1 lines inexpensive and easy to add.

To create the switch, which made its debut in 1976, Northern Telecom consulted with the U.S. Rural Electrification Administration, the federal agency that has provided more than $7.7 billion in loans and loan guarantees to rural phone companies.

In preparation for divestiture, the company started courting the RBHCs in 1980; it engineered into its equipment algorithms that would help small central offices track the snarled division of revenues that occurs when calls are routed from local exchange carriers to interexchange ones.

Northern Telecom has not lost its early lead in the rural communications market. John Kincaid, coordinator of regulatory affairs for a subsidiary of Contel Corp. in Victorville, Calif., said that Northern Telecom "took the time to study the needs of the industry."

Block that call!

Sierra On-Line, Inc. of Oakhurst, Calif., is a successful developer of computer game software. The corporation moved from Los Angeles to the outskirts of Yosemite National Park in 1979 because its founders wanted to live in the country.

Before AT&T upgraded its switch in Stockton, Calif. — the nearest big city — and local exchange carrier Sierra Telephone Co., Inc. changed over from a Northern Telecom crossbar switch to a DMS-100, customer telephone calls during heavy-volume periods put the town's telephone system into "gridlock," says Ed Heinbockel, Sierra On-Line's chief financial officer. As many as one out of five calls coming into the closest AT&T node in Stockton was blocked at such times.

After the cutover in 1988, busy signals were instead the result of too few lines coming into Sierra On-Line's Mitel, Inc. SX-200 private branch exchange. This has been resolved by upgrading the PBX and by increasing the number of incoming trunks from 60 to 80. Of these, 32 are connected to the software company's 17 Intel Corp. 80386-based personal computers.

In December 1989, Sierra On-Line decided to move to partial bypass. Two T-1 cards were added to the company's PBX: one supports a $2,100-per-month US Sprint Communications Co. line for all outbound 1-plus long-distance calls; the other, a $3,700-per-month line connected to AT&T's point of presence 30 miles away in Fresno, Calif., provides the game manufacturer's customers with a 900 line for hints on playing the company's games.

According to Heinbockel, one big benefit of the T-1 cards is that channels have become so clear that a 1,200 bit/sec line providing connections to remote programmers, artists and on-line services has been upgraded to 2,400 bit/sec.

Small-town troubles

Sometimes, however, the rules of rural telecommunications can get in the user's way. John Huggins, vice-president of Tustin, Calif.-based semiconductor manufacturer Silicon Systems, Inc.'s (SSI) Grass Valley design group, had some problems when the division decided to move away from the costs and hassles of big city living to Grass Valley, Calif., in the Gold Rush country of the Sierra Nevada mountains.

When Huggins tried to set up a leased line between the 35-person office in the foothills and SSI's Southern California headquarters, he had to wait six months for AT&T and Pacific Bell to sort out who was responsible for which part of the 9.6K bit/sec link. MIS data, information for customer support and other design centers, and corporate Digital Equipment Corp. DECnet electronic mail are sent over SSI's five dial-up lines.

Galen Dunham, research analyst with the California Public Utility Commission (PUC), explains that the PUC routinely grants telephone company petitions to upgrade to provide digital services or to cross over local exchange carrier boundaries to provide customers with desired services.

However, according to Robert Harris, professor of business and public policy at the University of California, Berkeley, this is no way to set a state's communications policy. Businesses wanting to locate in rural areas often cannot wait to see if the PUC will allow the local exchange carrier to make necessary improvements to the local communications infrastructure.

Harris cites a recent example where Blue Cross/Blue Shield of California chose not to locate a 150-plus person data-entry back office operation in Willows, Calif., a small Glen County town about 90 miles north of Sacramento. The health insurer claimed that the existing central office could not support its data processing transmission needs.

Shirley Dempsey, manager of the Glen County Chamber of Commerce, says she's not so sure the switch was the stumbling block; Blue Cross/Blue Shield has set up shop in equally rural Jackson and Lakeport, Calif., where central offices were no more modern. But the fact that obsolete communications could be used as an excuse is significant to Harris.

"It's time to elevate the definition of 'universal service,'" Dempsey says. "Communications now enters into basic business decisions, where 10 years ago, [it] did not."

However, Lou Saviano, a spokesman for Pacific Bell, says the company "can't just dot the landscape with state-of-the-art equipment. We have to justify upgrades for more than one customer" (see "Regulatory crosstalk," this page).

Linda Holden is manager of operations support for CP National Corp. of Walnut Creek, Calif., an independent telephone company serving seven Western states. CP National recently became the Western Division of Alltel Corp. of Hudson, Ohio.

> "Small customers don't know about bypass, so they can't hold you for ransom."
>
> ▲▲▲

Holden says that when "companies move from urban areas to rural areas, they expect the same uptown services at the same prices. They expect no mileage charges and no premium charged just because they are the only customer demanding the service."

Alltel's Western Division will "occasionally agree with the customer," petitioning for tariffs to provide the desired service — particularly if potential revenues on the order of $50,000 per month are involved, Holden says. "Large customers can threaten to bypass. Smaller customers don't know about it, so they can't hold you for ransom," she says.

Hank Levine, a communications lawyer with the Washington, D.C. office of Morrison & Foerster, contends that if a telephone customer is big enough to want fancy services, it is big enough to offer the local exchange carrier enough revenue over time to offset the costs of required upgrades.

The Federal Communications Commission agrees. In a Texas dispute in which Arco Oil & Gas Co. wanted to bypass the local Plano Telephone Co. with direct microwave connections into Southwestern Bell facilities in Dallas, the local exchange carrier and the Texas PUC argued that this move effectively gutted the local franchise. The FCC ruled in favor of Arco, saying customers are free to do what they want in terms of interstate transport of communications.

According to James Troup, a lawyer who works at the Washington, D.C. law firm of Thelen, Marrin, Johnson and Bridges, this is a case where federal law preempts state concerns. The FCC's preemption has been upheld on the basis that companies should not be barred from using the most efficient means possible to carry out interstate commerce.

Contel's Kincaid contends that telephone companies should, in effect, bypass themselves to meet customer needs, creating special arrangements outside of established tariffed services when necessary. Lance Barnett, chief economist at the state of California's office of planning and research, says this may be against PUC regulations.

Look before leaping

Because business rates will continue to come down, Harris says he thinks rural communications users ought to be very careful when considering bypass. Users should examine options closely when looking into possible capital outlays involved in bypass because evolving tariff structures may obsolete these purchases in a few short years.

Bypass wasn't really on the agenda for Donald Melvin, Intel Corp.'s senior telecommunications strategist for its Folsom, Calif., installation, 15 miles east of Sacramento. When the chip manufacturer first built its plant, it had all of its initial communications needs met through the local central office.

Because the Folsom site was to become a hub for Intel's private worldwide network, Melvin wanted a diversity of routes and vendors to ensure reliability. The single fiber circuit Pacific Bell provided didn't offer route diversity so Melvin proposed a microwave link to Sacramento that linked domestic microwave and international satellite links.

While Intel continued using Pacific Bell services, Melvin initiated an innovative private network strategy linking sites in Arizona, New Mexico, Oregon and California with newer technologies, including fast packet switching. The company uses StrataCom, Inc.'s fast packet T-1 multiplexers.

The overall corporate network is evolving into an Integrated Services Digital Network, with ISDN Primary Rate Interface links planned for connecting to the public ISDN network as it becomes available in areas where Intel operates.

Intel also pilot-tested a full-color, real-time PBX-switched videoconferencing system linking its Santa Clara, Calif., and Folsom conference rooms. The system will be expanded to other sites this year.

Intel's video networking system may also be the answer to an as yet unmet need of most rural communications users — what SSI's Huggins calls "low-cost, reasonable-quality remote conferencing." Huggins says he perceives this to be SSI's most poorly served communications need and the one which is perhaps the biggest drawback to the design group's Grass Valley location.

No bypass

Some rural firms are not worrying about the intricacies of bypass technologies. Bruce Industries, Inc., a manufacturer of aircraft lighting and power distribution systems formerly located in the Los Angeles area, moved to Dayton, Nev., 10 miles outside of Carson City, Nev.

The company wanted to escape from Southern California's high real estate prices — and got the added benefit of wild mustangs occasionally roaming in its parking lot.

The largest rural employer in Nevada, 500-employee Bruce Industries supports its 3Com Corp. nets linking Apple Computer, Inc. Macintoshes, IBM 386 clones and facsimile machines over a mix of AppleTalk and Ethernet networks. Through Nevada Bell, contact is maintained with the outside world using telex and 19.2K bit/sec Telebit Corp. modems.

The first major concern for Jon Bartmettler, manager of information services at the company, was the proximity of the firm to the intersection of the local power company's grids. The high-voltage lines have created havoc with the sensitive microcircuitry of Bruce Industries' computers and communications devices.

The company experienced an outage a day on its network until Bartmettler installed uninterruptible power supplies on a terminal linked to a Unisys Corp. mainframe in New Hampshire, on every microcomputer and on an onsite First Interstate Bancorp automated teller machine.

With that under control, Bartmettler is now concerned about virus infestations brought in by bulletin board users and the isolation his company faces if the fiber backbone between Carson City and Reno, Nev., is damaged. He plans no backup networks, though he might consider installing a microwave network or piggybacking onto the fiber line AT&T is planning to run from Nevada to Nebraska.

For support, Bartmettler relies heavily on 3Com's Compunet user network and on his Carson City Macintosh dealer. He believes rural communications users need to be self-sufficient; ultimately, he says, "you have to train your own people."

Banding together

Some rural telephone companies upgrade far in advance of their customers' expectations or imaginations.

Iowa Network Services (INS), a group of 128 rural Iowa telephone companies, uses a Northern Telecom DMS-100 as a hub in Des Moines, Iowa. The DMS-100 offers 865 miles of fiber and is capable of offering DS3 and DS1 services throughout the state, with connections to long-distance carriers — much to US West, Inc.'s consternation.

Appealing a recent decision made by Iowa's State Utility Board, US West is arguing that the board has exceeded its authority by introducing competition where none was needed.

US West also contends that the group forms a monopoly violating state and federal antitrust regulations by extending the local bottleneck or point of connection beyond the central office. In effect, US West asserts that it has an unfair monopoly that requires US West to use the INS tandem access switch to provide information services, instead of using one of its own switches.

US West has not appealed the FCC's approval of INS interstate communications through the interexchange companies. Briefs have been filed and arguments have been heard in the Polk County state general district court; the judge's opinion is pending.

The first INS call went through on May 1, 1989. By December 1989, INS was offering voice mail for its 150,000 rural subscribers, a service offered to few urban individuals by big-city telephone companies. Typical INS daytime basic prices are $1.06 per minute, compared with $1.13 for AT&T and $1.09 for US West.

INS may have had an indirect influence on Fargo, N.D.-based Melroe Co.'s positive experience with US West. A major manufacturer of compact, highly maneuverable loaders used in agriculture, manufacturing and construction, the 1,000-employee company is the largest manufacturer in the state and spends about $10,000 annually on data communications.

Melroe, a subsidiary of South Bend, Ind.-based Clark Equipment Co., has a US West-provided T-1-capable fiber line running between its Fargo corporate headquarters and its Gwinner, N.D., manufacturing plant located 90 miles away. The line has

(continued on page 104)

Regulatory crosstalk

Data communications users, regulators and local exchange carriers are caught in a dilemma. Regulatory policies and practices have not kept pace with innovative technologies because no one is sure what their long-term effects on business development will be.

For example, public utility commissions routinely require local exchange carriers to justify payback for equipment modernization based on expected demand over an 18-month to five-year period. Bruce Jamison, director of regulatory affairs for Pacific Bell, says that given current demand in some rural areas, it could take 25 years to pay for modernization. Therefore, some areas may never be upgraded to modern digital services.

Pacific Bell is currently petitioning the California Public Utility Commission to modernize all of the carrier's switching equipment, even if it means taking a loss, in return for loosening regulations in other parts of its business.

According to Kirby Smith, California field representative for the Rural Electrification Administration (REA), the president of Pacific Bell said at the 1988 California Telephone Association meeting in Monterey, Calif., that the regional Bell holding company wasn't able to justify installing a new switch in the state's capital unless the supplier took some of the risk with custom features for businesses.

"Bureaucratic conservatism regulates along sharp lines," says Robert Harris, professor of business and public policy at the University of California, Berkeley. "Technology makes the sharp lines ridiculous."

Bob Jacobson, principal consultant for the California State Assembly's Utilities and Commerce Committee, says he has less sympathy for Pacific Bell. He suggests that rural areas are not perceived as being strategically important; therefore, they're not given priority.

Jacobson says he perceives a vicious circle: Because Pacific Bell doesn't make available the most modern communications services in rural areas, companies won't move or spring up there; therefore, the telephone company will not need to go beyond its big-city markets.

Regional planning is lacking in the communications industry, unlike in the transportation and agriculture industries. Public interest in the continuing economic development of rural areas and demassing of urban areas needs to be taken into account.

"The welfare of the underserved is not going to be considered if Pacific Bell is relaxed from its public benefit responsibility," Jacobson says.

Harris says he worries that the technological lead the small local exchange carriers have over the large ones may fade as the effects of predivestiture cross-subsidization diminish. However, Smith says regulators are not going to let "cross-subsidization go away as fast as the deregulators want."

— Paulina Borsook

Telco Research
A NYNEX Company

October 31, 1989

Gary Beach
President
Network World Publishing, Inc.
375 Cochituate Road
Framingham, MA 01701

Dear Mr. Beach:

We recently placed an advertisement in your publication using the FAXNet information service. Soon after our ad appeared, leads started coming in - not in droves, but good leads. This contrasts with the "tire-kicking" bingo card leads we normally get which come in droves but rarely provide worthy leads.

Not only does FAXNet provide us with valuable information about prospects, the fact that someone takes the time to fill out the form and fax it to us is a good indication that they're serious about our telemanagement products and network design services.

FAXNet is a service who's time has come, and it's good to see a magazine that follows industry trends and innovations come up with innovative ideas as well.

Sincerely,

Stephen Doster
Marketing Communications Manager

1207 17th Avenue South
Nashville, Tennessee 37212
615-329-0031

Just what the doctor ordered

By WESLEY RISHEL

Modern health care depends on a constant, uninterrupted flow of data. Patient records, insurance information and digitized images constantly traverse the computer networks of today's hospitals, clinics and provider offices.

Unfortunately, today's medical networking environments are often either primitive or proprietary. This can cause major problems in making sure the right information gets to where it's needed, when it's needed.

The Health Level 7 (HL7) Standards Committee, an ad hoc group of health care institutions and systems vendors, has come up with a cure for what ails these disparate networks: the HL7 protocol, which outlines standard specifications for common application interfaces.

Today's environments

Today's automated medical systems environments can be characterized as primitive, proprietary or both. Primitive environments do not provide the rich support functionality of the higher levels of the Open Systems Interconnection protocol. Proprietary environments provide varying degrees of support with vendor-specific software. Both environments are important to the HL7 group because the protocol must operate in primitive environments but should also be suitable for more advanced proprietary environments.

Targeting today's environments creates a considerable challenge. One important issue that must be addressed is how to compensate for the unavailability of protocol software for the higher layers of the OSI model by using techniques available to ordinary application programmers. Another is the need for a standard that users can implement today without worrying about it becoming obsolete when the upper levels of OSI functionality become universally available.

These environments fall into one of the following categories:

- **Unreliable.** These are ad hoc environments that do not provide even basic transport reliability. They consist of point-to-point RS-232 links, modems and even some local-area networks.
- **Reliable transport.** These are environments that have a robust transport level but do not fully meet the high-level requirements. This includes environments with a fully implemented International Standards Organization (ISO) transport protocol, Transmission Control Protocol/Internet Protocol, DECnet, LU 6.2 or some other Systems Network Architecture environments.
- **Fully functional.** These consist of OSI and proprietary networks that implement presentation-level and other high-level services.

The ISO Remote Operation Service Element (ROSE) and Courier Remote Procedure Call are examples of such services.

The services in such environments include session control (managing the transmission of messages and separating them from one another), presentation (converting between machine-specific data formats and the format used in the messages), association control (coordinating between the systems to ensure that options are established properly and communications can occur), and other services that simplify the writing of a protocol.

To provide application-level

(continued on page 68)

Rishel is technical chairman of the Health Level 7 Standards Working Group.

The HL7 standard is the prescription for the communications ills of a wide variety of medical environments.

(continued from page 67)
functionality in a variety of environments, the HL7 standard is structured into a hierarchy of three protocols:

- The abstract message, which is the basic level of definition within HL7. This level only specifies when to send data, which data to send and the treatment of application errors. This level applies to the fully functional environments described above.
- The encoding rules, which apply in reliable transport environments. They specify the exact string of bytes to be sent from one application to another, rather than just listing the fields abstractly.
- The HL7 lower-level protocols (LLP), which generally deal with the elementary communications functions missing in unreliable environments. A variation of the LLP is applicable to some reliable transport environments.

Each of these protocols represents a useful implementation of the HL7 standard, and they are defined in a modular fashion. Applications written to the abstract message level will not have to be changed to operate with the encoding rules. Similarly, programs that are written to include the HL7 encoding rules can run directly over reliable links or use the LLP to exchange the same messages over unreliable links.

Abstract message

When a trigger event — such as a patient being admitted to a hospital — occurs, it causes network users to take actions that create the need to send information from one system to another.

The HL7 standard describes an abstract message as a group of segments — logical groupings of data. The message schematic shows the pattern of segments permissible in the message. It also shows which segments are optional and which may repeat.

A separate segment table describes each segment. It lists the following information about each data element: its maximum length, its type, whether it is required or optional, whether it may repeat, a name, a unique identifying number, and for some, a table of permitted values and textual comments to describe its meaning or use. The sequence column in a segment table is not relevant to the abstract message definition.

The HL7 standard includes several data field types, including String, Numeric and ID (defined by a table of legal values). Special data types deal with names, addresses, telephone numbers and reformattable text.

The message schematic and segment definitions together specify not only which data elements appear in a message, but also which ones are optional and which may repeat. This level does not specify the method of representing the values; in environments that provide full presentation-layer support, the operating system's communications software will determine the actual message formats. They are irrelevant to a standard that deals only with Layer 7.

Encoding rules

In a message encoded using HL7 rules, each segment begins with a three-character "literal," which identifies it, and each ends with a segment separator character. The data fields of a segment follow the identifying literal preceded by field separators. Trailing spaces and superfluous zeros are eliminated. Special rules describe how to encode the various data types. The sequence column in the segment definitions defines the position within a segment.

All data is represented as displayable ASCII characters (hexadecimal values between 20 and 7E, inclusive). All the special separators and other special characters are also displayable ASCII characters, except that the segment separator is the ASCII carriage-return character.

The encoding rules distinguish between data fields that have the null value and those that are not present. This distinction is important when a record is being updated. In the former case, the field in the data base should be set to null; in the latter case, it should retain its prior value.

The encoding rules specify that if a receiving application cannot deal with a data field that is not present, it should treat the data field as present but null. The encoding rules also specify that a receiving application should ignore fields that are present in the message but were not expected, rather than treat such a circumstance as an error.

The HL7 committee chose encoding rules that differ from those adopted under the CCITT X.409 and ISO 8825 standards for general data transmission. Both of those standards specify message formats that contain the definitions of the data content and length embedded within. The HL7 committee took a different approach because of the constraints imposed on the protocol to operate in today's networking and application development environments.

In tomorrow's environments, application programmers will use the ISO formats without direct involvement or knowledge of the format details. This is because the program routines to encode and decode messages will be a part of the network software available to all applications.

Today, application programmers write the code to compose the message string using application-level languages and tools including the MUMPS operating system, the MIIS operating system, Basic and special-purpose systems such as Pick. The more straightforward message formats permit application programmers to write and maintain efficient code in these environments while retaining most of the benefits associated with the ISO/CCITT formats.

Lower-level protocols

Messages composed using the HL7 encoding rules may consist of thousands of characters. Depending on the environment, the exchanging messages may need to include certain functions associated with Layers 2 to 5 of the OSI model. These include delimiting a message within a data stream, flow control, buffer management, and detecting and recovering from data-link errors. As with the encoding rules, the HL7 protocols that support this functionality are somewhat simple and more suitable for efficient programming using application languages than are the corresponding ISO protocols.

An institution chooses one of three LLPs to deal with its specific needs:

- The minimal LLP only prepends and appends characters to delimit a message. It is used over TCP/IP networks or in other communications environments that provide reliable data streams.
- The X3.28-based LLP, adapted from ANSI X3.28, is for use over RS-232 circuits. It provides flow control and buffer management by breaking the message into small blocks and sending the blocks with checksums and sequence numbers.
- The hybrid LLP supports environments that are in between. Many LANs, for example, provide reliable circuits over most of the network but still use unreliable RS-232 connections to host computers. The LAN typically provides flow control, but there is a need for minimal error checking due to the RS-232 link. This protocol sends the entire message as a unit but concatenates a simple checksum and character count to detect communications errors that are assumed to be infrequent.

HL7 standardizes data interchanges, not the underlying application systems. It supports diversity through its multilevel approach and by requiring only the data fields necessary to support the logic of the relationships among the messages or their basic purpose. Most fields are labeled optional.

To apply the standard in a given environment, the site administration must promulgate a number of decisions to the vendors operating at that site. These include:

- The level of HL7 to be employed.
- The corresponding level of network functionality to be used.
- Local issues relating to the network interface, including the definition of addressing conventions and circuit-control mechanisms where applicable.
- The specific transactions and data fields to be used.

Often, an institution that is using HL7 will need to solve specific problems that haven't been addressed in the standard. The committee has defined a means by which local sites can add to the protocol without creating potential conflicts with future releases. A site can use this facility to design whole new interfaces or to piggyback new data fields on existing messages. To do so, the site specifies new message IDs and segment IDs that begin with "Z."

The standard reserves all such IDs for local use within an institution. This will allow local adaptations to be implemented without conflicting with future versions of the specification.

Evolution of the standards

Standards must evolve as the applications they support change and as a result of experience using them. In recognition of this, the HL7 standard includes a protocol version ID in all messages. A site will add new transactions or data elements as a result of changes in the standard or changes in the local variations.

It is important that these changes can be implemented without requiring all communicating applications to upgrade simultaneously. This concern is generally addressed at the presentation level. The HL7 encoding rules meet this concern through their provisions for dealing with fields that are not present or are unexpected.

A site can implement programming changes to the sending system first. The receiving system will ignore the new fields until they are changed to use them. Often, these rules also permit changing the receiving system first. Until the sending system is changed, the receiving system will find the new data field "not present" and deal with this according to its rules for data not present.

Similarly, the HL7 encoding rules support changes in data field sizes. Fields are found within the message by examining separators, rather than by an offset. Changing the size of a field does not change the procedure used to detect subsequent fields.

The modular definition of the HL7 standard supports the transition from today's environments to fully compliant ISO environments. Programming agencies that structure their interfaces in a manner that parallels the protocol definition should be able to eliminate the HL7 encoding rules and lower-layer protocols by replacing them with the corresponding ISO elements.

Further, the abstract message protocol is similar to ROSE for on-line transaction applications. A specific Institute of Electrical and Electronics Engineers, Inc. project, P-1157, is developing a health care protocol assuming a full ISO stack, including the ROSE and the Common Management Information Service element. The IEEE and HL7 groups maintain an active liaison to simplify the transition from today's ad hoc environments to the world of OSI.

Early experience

The HL7 protocol is still in a nascent stage. More than 250 vendors, hospitals and consulting firms are members of the HL7 Committee, and the average attendance at a working group meeting exceeds 60. The group published Version 2.0 of the standard in September 1988; a dozen vendors have implemented that version for use in a demonstration that has been shown at health care information system shows since February 1989.

The next such event is scheduled for the Health Information Management Systems Society show to be held Feb. 19 to 20 in New Orleans. A dozen vendors have completed or are in the process of developing production interfaces at hospitals. The feedback from the progress to date is that the protocol can be easily implemented using existing application tools and that the interfaces run with acceptable efficiency and reliability.

In the meantime, the HL7 group continues to define additional functional interfaces.

HL7 standardizes data interchanges, not the underlying application systems.

▲▲▲

A dozen vendors have completed or are developing production HL7 interfaces.

▲▲▲

Fax pacts

By BENJAMIN WRIGHT

Contracting via fax machines could leave the user on shaky legal ground.

As the volume of facsimile traffic grows, so does the number of disputes over the legal status of faxes. Already, one protracted lawsuit in New York, Bazak International vs. Mast Industries, 538 N.Y.S.2d 503 (1989), has revolved around the meaning of five faxed purchase orders covering the 1987 sale of $103,330

(continued on page 70)

Wright, a Dallas-based attorney, is the author of EDI and American Law: A Practical Guide, *published in 1989 by the Electronic Data Interchange Association in Alexandria, Va.*

This article covers important legal matters and is intended to have general educational value. The development of specific practices for creating and delivering legal documents should be done with the advice of legal counsel.

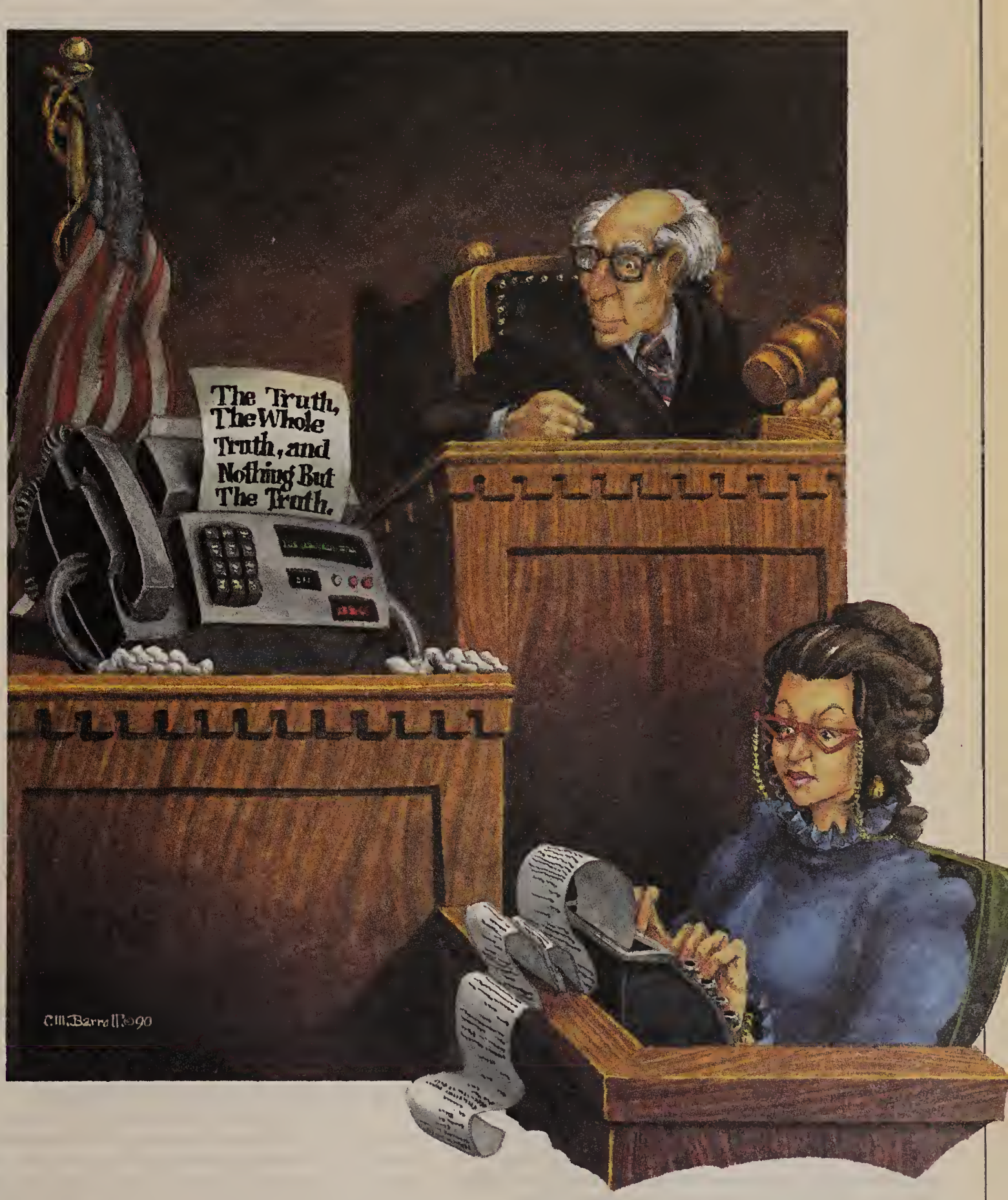


ILLUSTRATION ©1990 TOM BARRETT

(continued from page 69)
worth of textiles. Fax has gained popularity as a business communications tool so rapidly that few companies have carefully investigated the best ways to use it. Some ad hoc customs have developed, but they do not always seem well considered.

Today, when faxing a legally significant document, such as a signed contract, the custom among cautious users is to mail the fax recipient the original paper as well. The reason is that the legal utility of fax is perceived as suspect.

But the practice has two shortcomings. First, it is double the work. After the document has arrived by fax, why continue to shuffle paper by delivering it a second time?

Second, the practice may raise some ambiguity. Business people send signed faxes to show that they are bound by a document. But after sending a fax, unscrupulous people might try to disavow the document before mailing the original. They might argue that the necessity of mailing implies that the deal is not final until the paper is in the mailbox.

Although it seems likely that a court would hold a person to the terms in a signed fax, the ambiguity is a little disturbing.

With conventional telex — an older but similar technology — these problems seem to have been solved. It is customary, at least within some industries such as international shipping, to consider a telex message sufficiently legally binding to stand on its own.

Evidence suggests that we may be headed in the same direction with fax. Some government agencies are beginning to accept faxes for official filings without requiring the original documents to be mailed.

As early as 1985, the Federal Communications Commission permitted certain signed official filings to be delivered by fax, as long as the senders kept the originals in their files. The Patent and Trademark Office also allows some fax filings. And in November, the Idaho state courts adopted a rule, which went into effect Jan. 1, permitting signed court filings to be made by fax without a follow-up by mail.

Still, some government agencies, such as the Minnesota state courts, condition

(continued on page 74)

A signature is a signature

The customary way to show completion and approval of a written transaction is to sign it. Sometimes laws such as the Statute of Frauds require documents to be signed for them to be effective.

Traditionally, a signature is an autograph manually applied with an ink pen. A few laws may be read to require that the signatures on special documents, such as tax returns, be manual autographs. But for many other documents, that is not the only type of signature the law recognizes.

An authoritative source for general contract law, the Uniform Commercial Code (UCC), defines a signature as "any symbol executed or adopted by a party with the present intention to authenticate a writing." Such a signature could include a typed name or even a thumbprint. The UCC recognizes that even an authorization code on a telegram can be a signature.

A comment to Section 134 of the Restatement of Contracts — another authoritative source — suggests that a signature can generally be created by a carbon copy or photographic process.

The problem with faxes is that a forger can rather easily cut and paste a signature.

▲▲▲

Thus it seems that for general contracts, the main issue is not what symbol is adopted or how the symbol is created, but whether the originator intended the symbol to be a signature. So the real problem with signatures on faxes and other electronic transactions seems to be a practical one: How does one get enough evidence to prove intent?

But consider how much evidence of intent the recipient of a conventional, mailed document obtains: not much. Seldom do recipients check signatures against specimens. By custom, recipients typically rely on only the general facts and circumstances surrounding the document to know that the autograph scrawled on it is authentic.

So as a practical matter, signatures seem to protect originators more than recipients. If the originators' signatures are not on a document, they have good reason to deny responsibility for it.

The problem with faxes is that a forger can rather easily cut and paste a signature. So in a fax environment, originators may be less protected. For that reason, it might be a good idea for the originator to have original documents notarized and to keep them as proof as to what the originator did and did not agree.

— Benjamin Wright

"Today's application backlog is such a nightmare, it'll take more resources to fix it than even IBM has."

–a software developer

"You're right."

–IBM

Announcing AD/Cycle: The first fully integrated, total SAA, start-to-finish working environment for creating and maintaining applications.

From IBM. And friends:

BACHMAN Information Systems, Inc.
Index Technology Corporation
KnowledgeWare, Inc.

With computers humming along at 100 million instructions a second, it seems insane, but it's true:

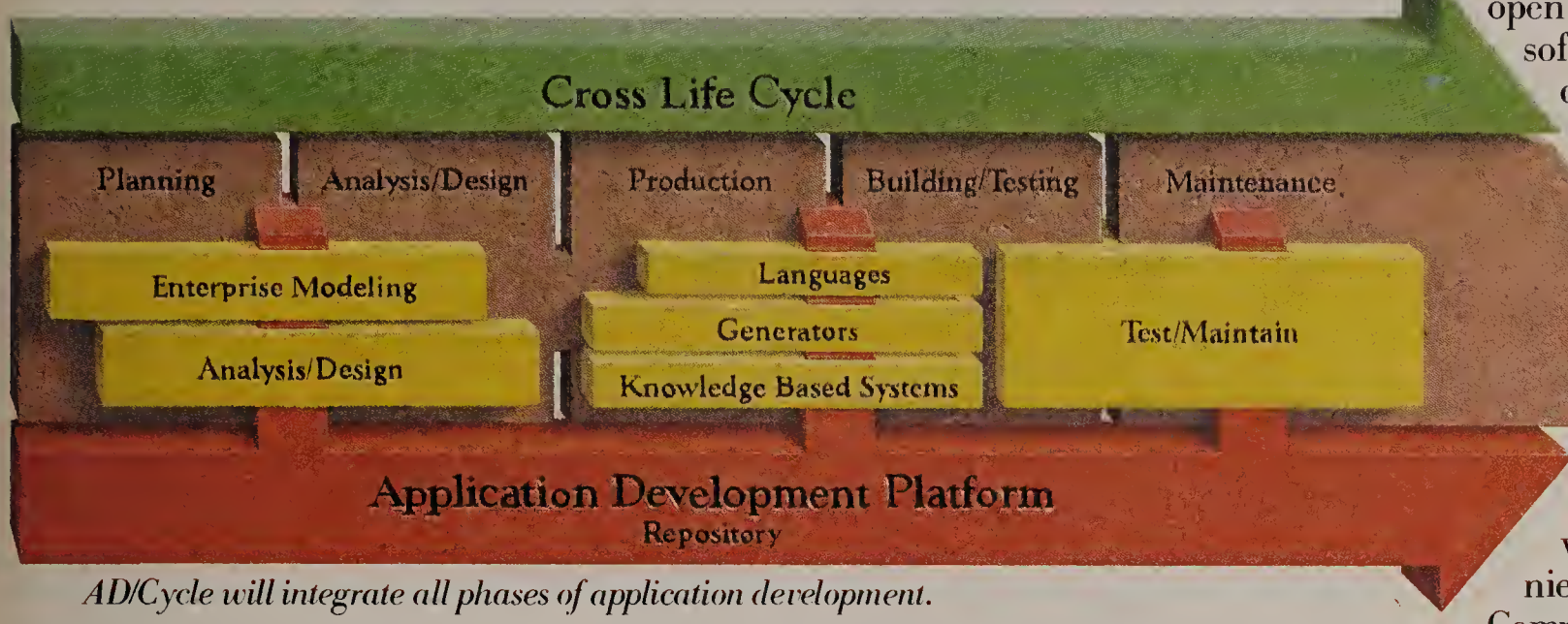
Programmers are averaging about 10 lines of code a day, and applications are backed up 2 to 3 years.

Worse, applications now take so long to create, they can be obsolete before they're finished. And when they are finished, they require so much maintenance, many programmers don't have time to write anything new.

It's a bigger problem than IBM, or anyone else, can handle alone. So our solution, AD/Cycle, teams IBM with some special IBM business partners.

And because you can't wait, many AD/Cycle products are available now.

But before getting into who's offering what, let's look at what AD/Cycle is, and why it is *the* development solution for the '90s.



AD/Cycle will integrate all phases of application development.

With AD/Cycle, planners and programmers can speak the same language.

The Right Idea.

To begin with, AD/Cycle is a framework that gives the entire development cycle something it never had before: a consistent set of standards. Within it, all phases of the process (see diagram) can be coordinated.

It's an arsenal of tools, too: CASE tools for planning, analysis and design, a variety of 3rd-generation languages, application generators, knowledge based systems, testing and maintenance tools, plus cross life-cycle tools that tie everything together.

And, because a real obstacle to getting applications done right is getting people to communicate, AD/Cycle also offers a repository for sharing information: details about a company's structure and methods, expressed in a uniform way, to keep executives and programmers on the same wavelength.

Thanks to SAA™, these pieces not only will fit together but can produce code for multiple IBM operating systems. And you can use as many, or few, AD/Cycle tools as you need.

The Right Tools.

AD/Cycle has too many tools to describe them all, but here are some highlights.

Along with products from IBM, key elements of AD/Cycle are coming from BACHMAN Information Systems, Inc., Index Technology Corporation and KnowledgeWare, Inc.™

Each is a leader in CASE technology, with products that reduce years to months, and months to days.

Their sets of tools will combine enterprise modeling, validation of models, data structure analysis and more, all using the graphical interface of SAA.

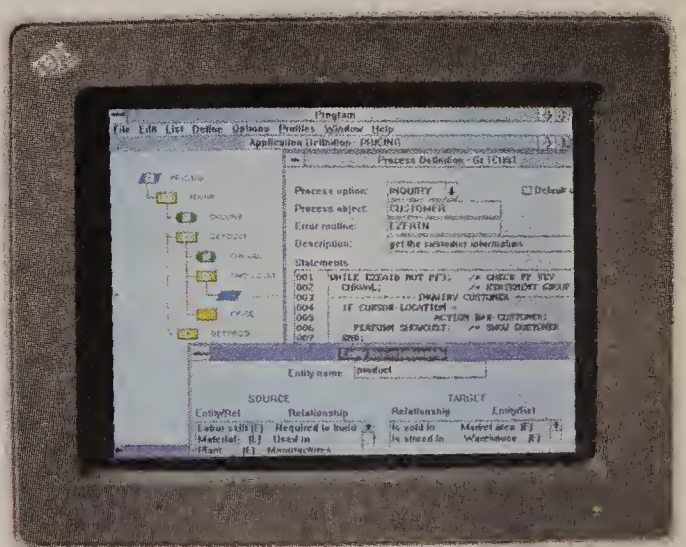
In addition, new releases of IBM Cross System Product (our application generator) will run on both OS/2™ EE workstations and hosts. Through CSP, many AD/Cycle tools can build applications for all SAA systems: OS/2, OS/400,™ VM and MVS.

And because AD/Cycle is an open architecture, many other software vendors are creating development tools that will integrate with it, taking full advantage of IBM's repository manager.

Right Now.

To help you get going with AD/Cycle, IBM's Systems Integration Division is joining forces with leading service companies. CAP Gemini America, Computer Power Group, Computer Task Group and GE Consulting will be working with us to assist you in planning, training and implementation.

OS/2 EE versions of AD/Cycle tools will arrive through 1990, but you don't have to wait to get started. Many tools are available now, and with excellent track records.



All AD/Cycle products will have the easy-to-use, SAA graphical interface.

Response to AD/Cycle, from both vendors and users, has been overwhelmingly positive. Clearly, it represents the future of application development.

So for you, the question isn't if, but when. And when is now. To get started with AD/Cycle, call your IBM Marketing Representative today.

IBM

(continued from page 70)
the filing of official documents by fax on the mailing of the originals. Minnesota attorneys have not made much use of the rule yet, largely because of the mailing requirement.

So can the general business fax user confidently dispense with mailing original contractual correspondence?

What issues are involved, and how might they be addressed?

The most obvious legal issue perceived with fax is the signature. Today, the signature on a fax printout is typically not considered an original.

But when the law requires a signature, it usually does not require ink flowing from a pen (see "A signature is a signature," page 70). Generally speaking, a signature is any mark that the signer intends to be a signature.

One law case has, in fact, ruled on the legality of a faxed signature. In Beatty vs. First Exploration Fund, 25 B.C.L.R.(2d) 377, a 1988 case in British Columbia, members of a limited partnership disagreed as to whether a faxed voting proxy was legally effective. By law, the proxy had to be signed, and the fax in question did bear a facsimile signature.

The court determined that the fax was signed and upheld it. This may have been the first case anywhere to rule directly on the legal effectiveness of a faxed business document.

Because it is a solitary case, however, its importance should not be overstated. It does not fully resolve what the effect of a faxed signature is.

In practice, one way to deal with the signature issue might be for signers to state in their faxed documents that they adopt the signature printed by the receiving fax machine as an original signature: "Jane Doe intends the facsimile of her autograph printed by the receiving fax machine to be her original signature." That may preclude any dispute over whether the fax printout is signed.

Authenticity

That idea of adding a clarification clause raises a red flag. All involved fear that it may be difficult to prove the authenticity of a fax and the signature printed with it. It is technically possible for a criminal to clip a signature from one document, photocopy it onto another and fax the photocopy to create a fake document.

One remedy for this problem might be to route important faxes through a trusted intermediary, such as an independent communications carrier, which would keep dated copies of faxes and records of who originated them. Senders of the faxes could identify themselves to the intermediary with personal identification numbers, smart cards or other authentication devices. If the origin of the fax is ever questioned, the intermediary's records could be consulted.

An independent intermediary would face several obstacles, however. Stored records of faxes could, in some cases, be subject to secret government inspection under the Electronic Communications Privacy Act of 1986.

Moreover, the record retained by the intermediary would be a type of property in which both the sender and receiver would have an interest. Devising a scheme to govern this property — such as how to pay for its maintenance and protection through the years; how to transfer it to someone else, such as in a transfer of corporate assets; and when to destroy it — would be troublesome.

A possible solution applicable to important faxes transmitted between conventional fax machines would be to have the original document notarized before faxing it and have the notary document the event in his official records. Thus, originators could keep dated and notarized copies of all faxes so that they could prove which faxed documents they did and did not sign.

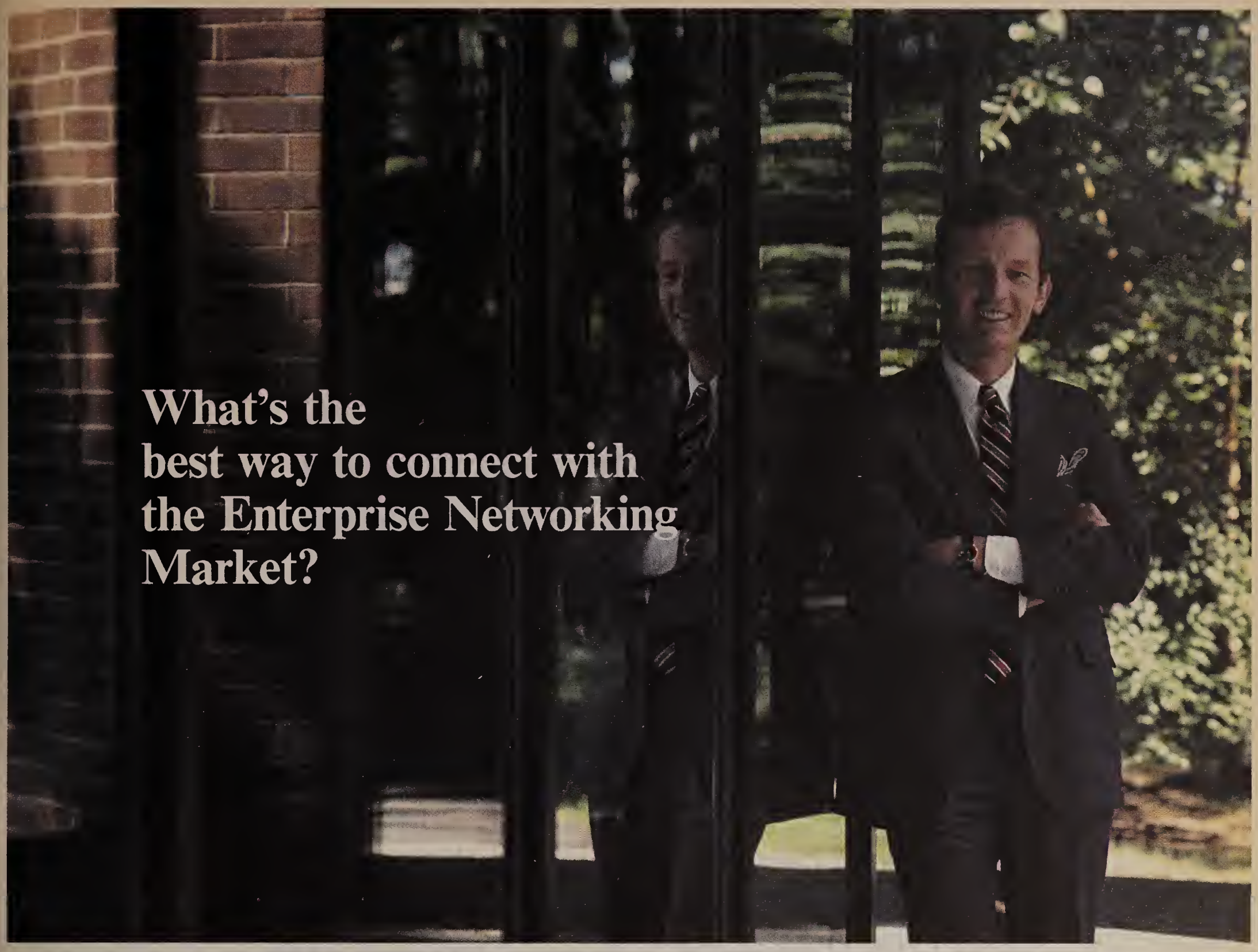
What's more, if there is a dispute over the genuineness of the notarized signature on a fax printout, a court could check the notary's records to see if the signer did indeed come before the notary on the indicated date. If there was no record, then the validity of the signature would be suspect.

Page switching

A problem related to signature authenticity is page switching. A dishonest fax recipient could fabricate a page and substitute it for one of the genuine pages.

(continued on page 77)

Gary Beach, Publisher, *Network World*



Get Gary Beach on the phone.

Gary publishes *Network World*, IDG's newsweekly for users of enterprise-wide local and wide area networks. Rated the best in its field by a comprehensive Wall Street Journal Study, *Network World* is the "most important/useful" publication reaching the fastest growing segment of the computer/communications technology industry.

Network World's readers are leading and shaping the enterprise networking revolution. And they've come to depend on *Network World* for the hard news they need to keep up with this rapidly changing field. Quality editorial and quality readers are two reasons why our ad pages continue to grow.

Network with Gary Beach at 1-508-820-2543. He'll show you why the time to position your products and services to the enterprise networking market is now and the publication is *Network World.*

Network World is part of IDG's worldwide family of publication, exposition and research companies providing the best in information on the information technology industry.

International Data Group
5 Speen Street
Framingham, MA 01701-9171
(508) 875-5000

IDG

Answers for the Information Age.

Heckuva way to run a network.

At first, most networks are fast and efficient. But as more people crowd aboard, they push their networks beyond capacity. Eventually, bottlenecks develop that make getting down to work a tough commute.

HYPERchannel®-DX takes a different route.

It relieves congestion by building smooth connections between dissimilar networks. It easily exchanges data across different protocols and media, including Ethernet, TCP/IP, and HYPERchannel. And HYPERchannel-DX leaves the door open for evolving standards such as FDDI and OSI. So your network grows according to your needs instead of screeching to a halt.

Call 1-800-338-0122 for information on HYPERchannel-DX products, consulting, and worldwide support. Why take a local when you can ride the express?

Network Systems®

See the FAXNeT Form on Page #108

(continued from page 74)

One of the deterrents to the switching of pages in conventional documents is for the sender to keep a copy of the original. Thus, the best that a page switcher gets is a swearing match in court over who has the true copy.

Likewise, fax senders could curb page switching by keeping the notarized originals. Moreover, they could have the notary initial each page of the original for identification. Although this does not make page switching absolutely impossible, it heightens the difficulty considerably.

Writing

Some laws require documents to be in writing. An example is the Statute of Frauds, which generally requires certain communications evidencing contracts to be written. One of the types of contracts the statute covers is agreements for the sale of goods worth more than $500 (see the Uniform Commercial Code Section 2-201).

A traditionalist might argue that a fax is not written, but the argument seems outlandish. The Uniform Commercial Code defines writing as any "reduction to tangible form." Historically, reduction to tangible form usually meant placing ink on paper with a pen or typewriter.

Yet a telex or telegram is generally considered a tangible form of writing. In essence, fax produces the same thing that telex or telegraph does: It records telecommunicated information in symbolic, visual form on paper. One can read a fax just as easily as one can read a conventional letter or a telex.

One of the questions in Beatty vs. First Exploration Fund was whether the fax printout was written. The court ruled it was.

A solution to the writing issue — if a real issue is perceived — might be for senders to state in faxed documents that the printout is writing. That precludes senders from arguing that the commitment was not in writing; however, it does not necessarily bind recipients to the idea unless they sign the fax and send it back.

Best evidence rule

Will faxes be admitted into courtroom evidence? Faxes have already been admitted in some lawsuits, such as the British case Carne vs. Debono, [1988] 3 All ER 485. In these cases, as will usually be true, the admission of the faxes was not contested because both parties agreed that they were authentic and should be admitted.

In the rare instance when a party opposes the admission of a relevant fax, one technical principle of evidence law, called the best evidence rule, may come into play. It prefers that the original, rather than a copy of a document, be admitted. It may appear that the fax printout is only a copy of the original. The best evidence rule may, therefore, hamper a recipient trying to admit a fax printout into evidence.

One way to circumvent the best evidence question might be to deem the fax an original counterpart. It is common for parties to a contract to create multiple counterparts of it so that each can have an original.

No principle of law says that each counterpart must print from the same machine or that signatures thereon must be created by the same process. So fax senders might state in their documents that they intend the received fax printout to be an original counterpart.

The Idaho state courts have adopted a similar idea. New Idaho rules of court state that when filing court documents by fax, the fax print is an original. The court clerk even stamps the printout "original."

Notice

Another possible objection to fax is that it is inappropriate for delivering important notices. Recipients might complain that they rarely receive important information by fax and have not developed office procedures to ensure that incoming faxes are promptly and correctly routed.

This complaint has merit. If the applicable law does not specifically permit fax notice, fax may not be proper.

So if, for example, two attorneys wished to give notice to each other in a lawsuit, they might not be wise to use fax unless the rules of litigation authorize fax.

For day-to-day contracting, the law is usually flexible on the method for notice of delivery. A notice, such as the acceptance of a bid, is generally effective if it comes to the attention of the recipient within the required time or if the sender takes reasonable steps to cause that to happen.

That means if the recipient has not suggested that the notice can be delivered by fax, faxing may not be appropriate.

In practice, the solution to the dilemma is simple: The sender can call ahead and get permission to send the notice by fax.

If, however, proof of delivery is important, a simple fax may not serve well. Although many machines issue transmission confirmation reports, these can be fabricated. Proof of delivery will still require certified mail or the return of an appropriate signed acknowledgment.

Reliability

Fax transmissions are not always reliable. Fax can distort words and drop lines or paragraphs.

But conventional documents also suffer from transmission errors. Pages are sometimes dropped during document assembly. Senders fail to include all enclosures in envelopes, and the Postal Service loses mail.

Accurate communication through the mail, therefore, requires both the sender and receiver to be careful and use common sense. Both have to double-check the contents of envelopes and place phone calls or send acknowledgments to confirm receipt.

(continued on page 105)

Where The World Connects

NETWORLD 90 BOSTON

HYNES CONVENTION CENTER • FEBRUARY 12-15, 1990

On February 12-15, 1990, at the Hynes Convention Center, NetWorld returns to Boston for an eagerly awaited encore. For four days NetWorld--the only computer trade show universally acclaimed as "the industry standard"--will be host to a dazzling display of the best in the business. Only at NetWorld can you count on reviewing everything you need to make the right networking decisions.

The whole connectivity industry comes together at NetWorld. Hundreds of exhibitors--from Apple to Digital to Novell to Sun to IBM--are demonstrating the newest, most exciting and best networking hardware, software and services. Whether you're planning your first network or evaluating cutting-edge options and advancements, NetWorld is the best place to see and hear it all.

Get smart fast at the world-famous NetWorld seminars

- over 100 sessions in the best Seminar Series in the business
- an added day just for conferences and new full-day Tutorials
- special tracks for LAN Management, Network Planning & Design, Basic, Standards, Software & Applications and more!
- your best educational opportunity of the year!

Call today for complete seminar, registration, travel and hotel information

800-444-EXPO!

TELECOM

WATS new?

By DANIEL BRIERE

For as long as telephone service has existed, basic long distance — also known as Message Telecommunications Service (MTS) — has been an integral part of most users' long-distance networks. This has been particularly true for smaller businesses and branches of larger corporations, which have not had enough long-distance traffic to justify traditional dedicated WATS services. Major corporate networks also have used standard MTS services as overflow from their more cost-efficient WATS and private-line network services.

During the past two years, however, this situation has dramatically changed; the reign of MTS service has ended. The restructuring of WATS services into virtually banded products and the repackaging of features and discounts to segment the market has made WATS services an economic necessity for almost every business user.

Faced with an increasingly competitive market and a more demanding customer base, the carriers have largely abandoned MTS services. Until a few years ago, WATS services weren't an option until customer usage reached at least $200 per month. Customers paying less than that had to rely on MTS for their long-distance calling.

Today, MTS is appropriate only for the smallest amounts of long-distance usage (zero to five hours per month); even then, it's a marginal decision. A user who makes more than one hour's worth of long-distance calls per month can probably find a less expensive WATS program that offers the advantage of enhanced services and volume discounts. The long-distance carriers have practically priced MTS into extinction.

MTS services are burdened by full-minute rounding and the highest rates for long-distance service. Casual callers — those using 10XXX equal access, where

(continued on page 80)

CHART • GUIDE

Three *Network World* Buyer's Guide charts comparing the features and prices of various WATS services can be found starting on pages 80, 82 and 84.

Briere is president of TeleChoice, Inc., a Manchester, Conn., telecommunications consultancy specializing in long-distance service analysis and network design. He can be reached at (203) 645-0471.

As WATS services continue to grow, feature enhancements and options, not price, are determining users' buying decisions.

WATS access line-based services

Company	Product	Target market (hours/dollars per month)	Installation charges (10)*	Carrier pays equal access conversion fee	Monthly charges (10)	Minimum call duration	Minimum monthly bill requirement	Accounting codes	Validated security codes (1)	Travel cards	Speed dial	Call detail on magnetic tape
Allnet Birmingham, Mich. (800) 982-4422	Premier Elite	25-500/$250-$5,000	Service, $0; per line, telco	No	Service, $0; per line, telco	6 sec	$250	Yes (2), nonvalidated, post-dialed, 2-3 digits; NRC, $0; MRC, $0	Yes, post-dialed, 4 digits; NRC, $0; MRC, $0 (3)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $250; MRC, $50
	Vantage	75-500/$1,000-$5,000	Service, $0; per line, telco	No	Service, $0; per line, telco	6 sec	$400	Yes (2), nonvalidated, post-dialed, 2-3 digits; NRC, $0; MRC, $15	Yes, post-dialed, 4 digits (3); NRC, $30; MRC, $20	Yes	No	Yes, NRC, $500; MRC, $100
AT&T Basking Ridge, N.J. (800) 222-0400	WATS	25-600/$300-$6,000	Service, $0; per line, $266	NA	Service, $12 per group; per line, $36.70	30 sec	$0	No	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $0; MRC, $0
MCI Communications Corp. Washington, D.C. (202) 872-1600	Prism III	40+/$450+	Service: $50; per line, $150	NA	Service, $0; per line, $35	6 sec	$0	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $5	No, post-dialed, 2 digits, NRC, $0; MRC, $0	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $500; MRC, $100
Telecom*USA, Inc. Atlanta (800) 868-2600	Business WATS	15-1,500/ $100-$10,000	Service, $0; per line, $100	NA	Service, $0; per line, $36.50	30 sec	$0	Yes, 2-4 digits, validated, nonvalidated, post-dialed; NRC, $0; MRC, $10+	Yes, post-dialed, 2-4 digits; NRC, $0; MRC, $10+	Yes, NRC, $0; MRC, $0	Yes, through autodialer; NRC, $35/site; MRC, $5/dialer	Yes, NRC, $0; MRC, $100

MRC = Monthly recurring charge
NA = Information not available
NRC = Nonrecurring charge
WAL = WATS access line

All listed carriers offer termination coverage in 50 states, Puerto Rico, U.S. Virgin Islands and international areas.
Carrier billing increment is 6 seconds unless otherwise noted.

*Footnotes:

1. Validated security codes are validated codes which, unless inputted correctly, will not allow completion of dialed call, regardless of access. Equivalent to validated account codes.
2. Allnet offers 4-digit nonvalidated, as well as 2- and 3-digit validated codes. Pricing varies by number of digits and number of codes.
3. Allnet offers 2- and 3-digit validated authorization codes for special access customers.
4. Requirement varies by state: Fla., $10,000; Texas, $8,000.
5. Prices vary depending on state: DAL, N.Y., telco; N.J., $125; Fla., telco w/$400 credit per line; Texas, $125.
6. Up to 8 speed dial numbers, one speed dial package, will be provided free of charge with every $300 in usage.
7. US Sprint uses a scale to determine the charges for validated account codes, 1-5 codes is $7 a month, up to 301-1,000 codes for $200 per month.
8. AT&T has a local line installation charge for its dedicated service (charge is variable depending on length and type of line).
9. There are other WAL- and DAL-based services that are based on banded pricing plans, which are not being actively sold by the carriers and for that reason are not included in this survey.
10. "Telco" refers to charges by the telco and are either billed by the telco or the interexchange carrier. In either case, the customer Incurs no extra fees from the interexchange carrier for this item.
11. Option 1: $20 (N.J.), $25 (elsewhere). Option 2: $45 (N.J.), $50 (elsewhere).

This chart includes a representative selection of vendors in the WATS access line-based services market. Most vendors offer other WATS access line-based services, and some vendors not included offer a full range of competitive products.

TELECHOICE, INC., MANCHESTER, CONN.

(continued from page 79)

XXX equals the long-distance carrier code — and low-volume users are the only remaining callers that realistically should use MTS.

All other users should migrate to WATS. WATS services no longer require the use of dedicated access lines (DAL), WATS access lines (WAL) and so forth to gain cost benefits. In fact, all but the high-end WATS services are predominantly offered through standard business telephone lines.

Defining WATS

The definition of WATS services is blurring in an industry burdened with age-old terminology — despite rapid technological innovation. Formerly, WATS referred to dedicated service with banded calling ranges; now, WATS services use a range of innovative access methods with a variety of pricing and feature packages.

WATS services use DALs, WALs and switched access lines to get calls from the customer's premises to the carrier point of presence (POP). Switched access line WATS services are the most popular for the low end of the market, while products that use DALs are mainly for the higher volume users. The long-distance carriers are predominantly selling only equal and dedicated access to the service; WALs are no longer an economically viable option in most of the country.

Base pricing formats do not vary much from carrier to carrier; they are largely discount tables based on MTS rates. Indeed, AT&T's Pro WATS program merely extends discounts off MTS rates in return for a fixed monthly fee. WATS, in this sense, is nothing more than a billing construct.

> Some services stray from the standard WATS band or range definitions.
>
> ▲▲▲

Some WATS services are innovative as they stray from the standard WATS band or range definitions. For instance, some of the smaller resellers around the country differentiate themselves by providing a wider calling area than their competitors, particularly in areas where there are strong communities of interest — that is, neighboring calling areas such as California and Nevada, between which a substantial number of calls are made.

Traditional WATS banded pricing is all but gone. Under that scheme, calls were priced according to the line over which the call was placed, not according to the call's destination. Optimizing networks with these services required users to perform time-consuming engineering analysis and constant maintenance. Virtually banded pricing has replaced traditional WATS banded pricing.

While the major carriers still tariff traditional banded WATS services, they are not actively selling the products and are working on migrating present users to other services.

At the high end of the market, WATS services are typically characterized by high-capacity T-1 access for heavy traffic volumes. But rate tables are again similar to the switched MTS-like WATS services, further blurring distinctions among products.

WATS pricing is looking more like a continuous discount table off MTS pricing, with greater discounts awarded to the highest volume users. A user simply migrates up the ladder as traffic grows.

Making the choice easier

By designing their services in such a manner, the carriers are reducing the need for complex analysis of which service is best for a particular user's network. MTS, WATS and even virtual network services have been molded into a consistent growth path. As a customer's traffic volume increases, the carrier will automatically migrate that user to successively higher discounted and more specialized long-distance services.

Within any particular segment of the market, the carrier is likely to have only a single service available. Only a year ago, the user would have had three or four WATS services in the $50 to $2,000 market from which to choose from any particular car-

(continued on page 102)

WATS the word?

■ **Band:** The geographic range that defines a particular calling area for billing purposes.

With traditional WATS, each successively higher band denotes a broader calling area and, therefore, higher pricing. Thus, for any specific customer, there is a series of concentric circles that determine the rates for calls from that customer's location. Banded rates are becoming obsolete, in favor of mileage-banded ranges.

■ **Dedicated access line:** A private access link that directly connects the customer premises to the carrier point of presence.

■ **Message Telecommunications Service:** Official name for long distance-dialed telephone service.

■ **Range:** In WATS and message telecommunications service, a mileage- or area code-based designation for the purpose of classifying calls for billing. A typical range may be all calls between 125 and 292 miles.

■ **WATS access line:** An access link between customer premises and the carrier point of presence. The connection between the premises and the nearest equal access serving central office is a dedicated connection; the remainder of the circuit is switched via the public telephone network.

— Daniel Briere

I AM INTERESTED IN YOUR PRODUCTS AND WOULD LIKE MORE INFORMATION ON THE FOLLOWING PRODUCTS:

Bell Compatible Modems
☐ Dial-up (300-4800 bit/s)
☐ Private Line (1200-4800 bit/s)

Leased Line Modems
☐ 0-9600 bit/s
☐ 19.2 bit/s
☐ Diagnostic
☐ Multiplexed

Network Control and Management
☐ NCMS/PC 386 (Network Processor)
☐ SPN Diagnostic Leased Line Modems
☐ DSU/CSU

Central Site
☐ Intelligent Chassis
☐ Dial-up
☐ DSU/CSU
☐ Leased Line

Standalone Dial Up
☐ CCITT V.32 Modems
☐ CCITT V.22/V.22 bis
☐ 300-4800 bit/s

DDS-DSU/CSU
☐ 2400-9600 bit/s
☐ 56 K
☐ Standalone
☐ Card

(800) 222-4NEC

☐ Please mail information
☐ I would like a demonstration of equipment
☐ I have a product requirement in 0-6 mos.
☐ Please have your representative call me
☐ I have a product requirement in 6-12 mos.

NAME/TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE _____ EXT. _____ TELEX/TWX/FAX _____

☐ YES, I WOULD LIKE TO REMAIN ON YOUR MAILING LIST.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO. 7887 SAN JOSE, CA

POSTAGE WILL BE PAID BY ADDRESSEE

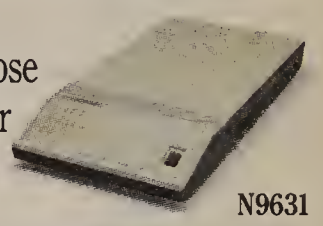
NEC America, Inc.
Data and Video Communication
Systems Division
Attn. Marketing Administrator
110 Rio Robles
San Jose, California 95134-1899 U.S.A.

OUR V.32 MODEMS WERE DESIGNED TO GO THROUGH HELL TO KEEP INFORMATION MOVING.

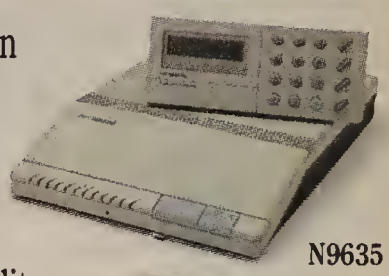
It's not unusual for temperatures to hit 110 degrees while ash rains from the sky at a typical fire camp. Lives are on the line. Your equipment better be up and running.

When the U.S. Forest Service decided upon NEC V.32 modems to help organize and transmit the massive amount of information necessary to move people and equipment, provide situation reports, coordinate air drops, and handle logistics, it was no fluke.

A major reason they chose NEC 9630 modems was their ability to transmit at the highest possible speed, virtually error-free, even over worst case lines.


N9631

Aside from that, our modems were carefully scrutinized for functionality, compatibility with existing equipment, ease-of-use and overall quality.


N9635

Obviously we passed the test.


N9630

When it comes time for you to decide which V.32 modem best fits your needs, be aware that no one has a more complete line than we do.

From the economical N9631 to the sophisticated N9635, you'll find advanced features such as remote configuration and monitoring, auto dial back-up, and complete diagnostics to name a few. To find out more, call us at 1-800-222-4NEC ext. 1277.

We realize you may never push your modems to the extremes the U.S. Forest Service does, but we're experts at putting out fires in business, too.

Photo courtesy of United States Forestry Services.

NEC

Come see us in Dallas at Interface '90, March 5th-8th, booth #522

See the FAXNeT Form on Page #108

Switched access WATS services

Company	Product	Target market (hours/dollars per month)	Installation charges (10)*	Carrier pays equal access conversion fee	Monthly charges (10)	Billing	Accounting codes	Validated security codes (1)	Travel cards	Speed dial	Call detail on magnetic tape
Allnet Birmingham, Mich. (800) 982-4422	Premier	0-25/$0-$250	Service, $0; per line, $0	No	Service, $0; per line, $0	Minimum call duration, 30 sec; minimum monthly bill requirement, $0	Yes (2), nonvalidated, post-dialed, 2-3 digits; NRC, $0; MRC, $15	Yes, post-dialed, 4 digits (3); NRC, $30; MRC, $20	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $500; MRC, $100
	Premier Elite	25-500/$250-$5,000	Service, $0; per line, $0	No	Service, $0; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $250	Yes (2), nonvalidated, post-dialed, 2-3 digits; NRC, $0; MRC, $0	Yes, post-dialed, 4 digits (3); NRC, $0; MRC, $0	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $250; MRC, $50
	Vantage	75-500/$1,000-$5,000	Service, $0; per line, $0	No	Service, $0; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $400	Yes (2), nonvalidated, post-dialed, 2-3 digits, NRC, $0; MRC, $15	Yes, post-dialed, 4 digits (3); NRC, $30; MRC, $20	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $500; MRC, $100
ATC Atlanta (800) 225-7778	Dial USA	0-5/$0-$50	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, validated, nonvalidated, post-dialed, 3 and 4 digits; NRC, $0; MRC, $0	Yes, post-dialed, 3 & 4 digits; NRC, $20; MRC, $20	Yes, NRC, $0; MRC, $0	Yes, NRC, $0; MRC, $.50/ number	No
	Standard Plus WATS	5-30/$50-$400	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Minimum call duration, 30 sec; minimum monthly bill requirement, $0	Yes, validated, nonvalidated, post-dialed, 3 & 4 digits; NRC, $10+; MRC, $10+	Yes, post-dialed, 3 and 4 digits; NRC, $20; MRC, $20	Yes, NRC, $0; MRC, $0	Yes, NRC, $0; MRC, $.50/ number	Yes, NRC, $200; MRC, $75
	Advanced Laser Plus	30-400/$400-$5,000	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Minimum call duration, 30 sec; minimum monthly bill requirement, $0	Yes, validated, nonvalidated, post-dialed, 3 and 4 digits; NRC, $10+; MRC, $10+	Yes, post-dialed, 3 and 4 digits; NRC, $20; MRC, $20	Yes, NRC, $0; MRC, $0	Yes, NRC, $0; MRC, $.50/ number	Yes, NRC, $200; MRC, $75
AT&T Basking Ridge, N.J. (800) 222-0400	Long Distance Service	0-4/$0-$50	Service, $0; per line, $0	Yes, during special promotions	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, where available	No	Yes, NRC, $0; MRC, $0	No	No
	Pro WATS	4-600/$50-$6,000	Service, $10; per line, NA	Yes, during special promotions	Service, $5; per line, NA	Minimum call duration, 30 sec; minimum monthly bill requirement, $0	Post-dialed, 2 digit, no charges, limited availability; full deployment expected 1990	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $54; MRC, $0
Cable & Wireless Vienna, Va. (800) 486-8686	Long Distance Service	0-4/$0-$50	Service, $0; per line, $0	No	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, nonvalidated or validated, post-dialed, numeric or alpha, 2-16 digit codes; NRC, $0; MRC, numeric $10 per 100, alpha $.25 per code	Yes, post-dialed, numeric or alpha; 2- to 16-digit codes; NRC, $0; MRC, numeric $20-$200 (varies by number of codes), alpha, $35-$300 (varies by number of codes)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $100; MRC, $100
	Focus III	4-80/$50-$1,000	Service, $0; per line, $0	No	Service, $5; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $0	Yes, nonvalidated or validated, post-dialed, numeric or alpha, 2- to 16-digit codes; NRC, $0; MRC, numeric $15 per 100, alpha $30 for first 25, $10 each additional 25	Yes, post-dialed, numeric or alpha, 2- to 16-digit codes; NRC, $0; MRC, numeric $20-$250 (varies by number of codes), alpha $40-350 (varies by number of codes)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $100; MRC, $100
	Focus II	80+/$1,000+	Service, $0; per line, $0	No	Service, $75; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $0	Yes, nonvalidated or validated, post-dialed, numeric or alpha, 2- to 16-digit codes; NRC, $0; MRC, numeric $25 per 250, $15 for additional 250, alpha $30 for first 25, $10 each additional 25	Yes, post-dialed, numeric or alpha, 2- to 16-digit codes; NRC, $0; MRC, numeric $35-$250 (varies by number of codes), alpha $50-$350 (varies by number of codes)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $100; MRC, $100
MCI Communications Corp. Washington, D.C. (202) 872-1600	MCI Dial 1	1/up to $15	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $5	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $500; MRC, $100
	Daytime Savings	1-20/$15-$300	Service, $0; per line, $0	Yes	Service, $0; per line, $130; T-1, telco	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $12	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $5	No	No	Yes, NRC, $0; MRC, $12.50-$30	Yes, NRC, $500; MRC, $100
	Prism Plus	20-400/$300-$4,000	Service, $5; per line, $0	Yes	Service, $10; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 3 digits; NRC, $0; MRC, $0	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $500; MRC, $100

This chart includes a representative selection of vendors in the switched access WATS services market. Vendors may offer other switched access WATS services, and some vendors not included offer a full range of competitive products.

TELECHOICE, INC., MANCHESTER, CONN.

Switched access WATS services (continued)

Company	Product	Target market (hours/dollars per month)	Installation charges (10)	Carrier pays equal access conversion fee	Monthly charges (10)	Billing	Accounting codes	Validated security codes (1)	Travel cards	Speed dial	Call detail on magnetic tape
Metromedia-ITT Long Distance Secaucus, N.J. (201) 333-5300	Performance (limited availability)	0-20/$0-$200	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $0	Yes, post-dialed, 3-4 digits; NRC, $0; MRC, $10 for 3 digits, $15 for 4 digits	Yes, MRC, $0; NRC, $0	Yes, NRC, $250; MRC, $100	Yes, NRC, $100; MRC, $50 per tape
	Custom Call 100	0-20/$0-$200	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $0	No	Yes, MRC, $0; NRC, $0	Yes, NRC, $100; MRC, $50	Yes, NRC, $100; MRC, $50 per tape
	Precision Options 1-4 (limited availability: Fla., Texas, N.J., N.Y.)	25-900/$250-$8,000	Service, $0; per line, $0	Yes	Service, $0-$99 (11); per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement for Options 1, 2, 3, $0, for Option 4, $4,000	Yes, validated, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $5	Yes, post-dialed, 3-4 digits, NRC, $0; MRC, $10 for 3 digits, $20 for 4 digits	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $250; MRC, $100 per tape
	One Step WATS (limited availability: Fla., Texas, N.J., N.Y.)	15-900/$150-$8,000	Service, $0; per line, $0	Yes	Service, $10; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $0	Yes, validated, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $5	Yes, post-dialed, 3-4 digits; NRC, $0; MRC, $10 for 3 digits, $20 for 4 digits	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $250; MRC, $100 per tape
	Custom WATS 100	14-900/$150-$8,000	Service, $0; per line, $0	Yes	Service, $10; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $0	No	Yes, MRC, $0; NRC, $0	Yes, NRC, $50; MRC, $0	Yes, NRC, $100; MRC, $50 per tape
Telecom*USA Atlanta (800) 868-2600	Line One	0-30/$1-$200	Service, $0, per line, $0	Yes	Service, $0; per line, $0	Billing increment, 30 sec; minimum call duration, 30 sec; minimum monthly bill requirement, $0	Yes, 2-4 digits, validated, nonvalidated, post-dialed; NRC, $0; MRC, $10+	Yes, 6-7 digits, predialed; NRC, $0; MRC, 2-5 codes $1 each, 6+ codes $.50 each or 2-4 digits; post-dialed; NRC, $0; MRC, $10+ depending on number of codes	Yes, NRC, $0, MRC, $0	Yes, through autodialer; NRC, $35 per site; MRC, $5 per dialer	Yes, NRC, $0; MRC, $100
	First WATS	10-1,200/$100-$10,000	Service, $0; per line, $0	Yes	Service, $0; per line, $0	Minimum call duration, 30 sec; minimum monthly bill requirement, $0	Yes, 2-4 digits, validated, nonvalidated, post-dialed; NRC, $0; MRC, $10+	Yes, 6-7 digits, predialed; NRC, $0; MRC, 2-5 codes $1 each, 6+ codes $.50 each or 2- to 4-digit codes; post-dialed; NRC, $0; MRC, $10+ depending on number of codes	Yes, NRC, $0; MRC, $0	Yes, through autodialer; NRC, $35 per site; MRC, $5 per dialer	Yes, NRC, $0; MRC, $100
US Sprint Communications Co. Kansas City, Mo. (800) 347-3300	Dial 1	0-1/$0-$8	Service, $0; per line, $0	No	Service, $0; per line, $0	Billing increment, 1 min.; minimum call duration, 1 min; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 5-digit codes; NRC, $0; MRC, $5 nonvalidated	Yes, validated, post-dialed, 5-digit codes; NRC, $20 validated; MRC, varies (7)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $50; MRC, $100
	Sprint Plus	1+/$8+	Service, $0; per line, $0	No	Service, $0; per line, $0	Billing increment, 1 min; minimum call duration, 1 min; minimum monthly bill requirement, $8	Yes, nonvalidated, post-dialed, 5-digit codes; NRC, $0; MRC, $5	Yes, validated, post-dialed, 5-digit codes; NRC, $20; MRC, varies (7)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $50; MRC, $100
	Dial 1 WATS	7-550/$100-$5,500	Service, $0; per line, $0	No	Service, $5; per line, $0	Minimum call duration, 6 sec; minimum monthly bill requirement, $0	Yes, nonvalidated, post-dialed, 5-digit codes; NRC, $0; MRC, $5	Yes, validated, post-dialed, 5-digit codes; NRC, $20; MRC, varies (7)	Yes, NRC, $0; MRC, $0	Yes, NRC, $0; MRC, $3 (6)	Yes, NRC, $50; MRC, $100

DAL = Dedicated access line
MRC = Monthly recurring charge
NA = Information not available
NRC = Nonrecurring charge
WAL = WATS access line

All listed carriers offer termination coverage in 50 states, Puerto Rico, U.S. Virgin Islands and international areas.
Carrier billing increment is 6 seconds unless otherwise noted.

Footnotes:

1. Validated security codes are validated codes which, unless inputted correctly, will not allow completion of dialed call, regardless of access. Equivalent to validated account codes.
2. Allnet offers 4-digit nonvalidated, as well as 2- and 3-digit validated codes. Pricing varies by number of digits and number of codes.
3. Allnet offers 2- and 3-digit validated authorization codes for special access customers.
4. Requirement varies by state: Fla., $10,000; Texas, $8,000.
5. Prices vary depending on state: DAL, N.Y., telco; N.J., $125; Fla., telco w/$400 credit per line; Texas, $125.
6. Up to 8 speed dial numbers, one speed dial package will be provided free of charge with every $300 in usage.
7. US Sprint uses a scale to determine the charges for validated account codes, 1-5 codes is $7 a month, up to 301-1,000 codes for $200 per month.
8. AT&T has a local line installation charge for its dedicated service (Charge is variable depending on length and type of line.
9. There are other WAL- and DAL-based services that are based on banded pricing plans, which are not being actively sold by the carriers and for that reason not included in this survey.
10. "Telco" refers to charges by the telco and either billed by the telco or the interexchange carrier. In either case, the customer incurs no extra fees from the interexchange carrier for this item.
11. Option 1: $20 (N.J.), $25 (elsewhere). Option 2: $45 (N.J.), $50 (elsewhere)

This chart includes a representative selection of vendors in the switched access WATS services market. Most vendors offer other switched access WATS services, and many vendors not included offer a full range of competitive products.

TELECHOICE, INC., MANCHESTER, CONN.

Dedicated access line-based WATS services (continued on page 102)

Company	Product	Target market (hours/dollars per month)	Origination method	Installation charges (10)*	Monthly charges (10)	Minimum call duration/Minimum monthly bill requirement	Accounting codes	Validated security codes (1)	Travel cards	Speed dial	Call detail on magnetic tape
Allnet Birmingham, Mich. (800) 982-4422	Maxcess I	500+/ $5,000+	T-1	Service, $0; per line, telco; CO, $0; access coordination, $0	Service, $0; per line, telco; CO, $0; access coordination, $0; port charges, $0	6 sec/$0	Yes (2), nonvalidated, post-dialed, 2-3 digits; NRC, $0; MRC, $15	Yes, post-dialed, 2-3 digits (3); NRC, $30; MRC, $20	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $500; MRC, $100
AT&T Basking Ridge, N.J. (800) 222-0400	Megacom WATS	600-3,000+/ $6000+	DAL, T-1, T-3	Service, $545; per line: DAL, $0; T-1, $310; T-3, $1,600; CO: DAL, $196; T-1, $310; T-3, $514; access coordination: DAL, $1,637; T-1, $207; T-3, ICB (8)	Varies state by state	18 sec/$0	No	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC,$0; MRC, $0
ATC Atlanta (800) 225-7778	Corporate Laser Express	400-1,500/ $5,000-$20,000	DAL, T-1	Service, $0; per line: DAL, $200; T-1, $450; CO, telco; access coordination, $0	Service, $0; per line, telco; CO, telco; access coordination, $0; port charges, $0	18 sec/$0	Yes, validated, nonvalidated, post-dialed, 3 and 4 digits; NRC, $0; MRC, $20	Yes, post-dialed, 3 and 4 digits; NRC, $20; MRC, $20	Yes, NRC, $0; MRC, $0	Yes, NRC, $0; MRC, $.50 per number	Yes, NRC, $200; MRC, $75
Cable & Wireless Vienna, Va. (800) 486-8686	Focus I	100-500/ $1,000-5,000	DAL, T-1	Service, $0; per line, $0; CO, $0; access coordination: DAL, $200; T-1, telco	Service, $0; per line: DAL, $125; T-1, telco; CO, $0; access coordination, $0; port charges, $0	1 min/$0	Yes, validated, nonvalidated, post-dialed, numeric or alpha, 2- to 16-digit codes; NRC, $0; MRC, $35-$350 (varies by number of codes)	Yes, post-dialed, numeric or alpha, 2-16 digit codes; NRC, $0; MRC, $35-$350 (varies by number of codes)	Yes, NRC, $0; MRC, $0	Yes, MRC, $0; NRC, $12.50-$30	Yes, NRC, $100; MRC, $100
	Excel	150-1,000/ $8,000-$70,000	DAL, T-1	Service, $0; per line, $0; CO: DAL, $0; T-1, $395; access coordination: DAL, $150; T-1, telco	Service, $50; per line: DAL, $130; T-1, telco; CO: DAL, $0; T-1, $62; access coordination, $0; port charges, $0	6 sec/$0	Yes, nonvalidated or validated, post-dialed, numeric or alpha, 2- to 16-digit codes; NRC, $0; MRC, $35-$350 (varies by number of codes)	Yes, post-dialed, numeric or alpha; 2- to 16-digit codes; NRC, $0; MRC, $35-$350 (varies by number of codes)	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $100; MRC, $100
MCI Communications Corp. Washington, D.C. (202) 872-1600	Prism I	400+/ $4,000+	DAL, T-1, T-3	Service, $25; per line: DAL, T-1, T-3, telco; CO: DAL, $176; T-1, $279; T-3, $500; access coordination: DAL, $150; T-1, $186; T-3, $2,200	Service, $25 per invoice; per line, telco; CO: DAL, $16.40; T-1, $62; T-3, $290; access coordination: DAL, $10.55; T-1, $21.70; T-3, $125; port charges, $0	6 sec/$0	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $15	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $75; MRC, $0
	Prism II	Equal access areas with less than 100/NA	DAL	Service, $50; per line: DAL, $250; T-1, T-3, telco; CO: DAL, $120; access coordination: DAL, $135	Service, $0; per line, $130 or telco (whichever is greater); CO: DAL, $16.40; access coordination: DAL, $10.55; port charges, $0	6 sec/$75	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $15	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $75; MRC, 0
	Hotel WATS	Hotels and businesses with less than 55% daytime traffic/NA	DAL, T-1	Service, $50; per line: DAL, $250; T-1, telco; CO: DAL, $0; access coordination: DAL, $0	Service, $0; per line, $100; CO, $0; access coordination, $0; port charges, $0	1 min/$0	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $5	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $500; MRC, $100
	University WATS	Universities and colleges with less than 55% daytime long-distance traffic/NA	DAL, T-1	Service, $50; per line: DAL, $250; T-1, telco; CO: DAL, $120; T-1, $279; access coordination: DAL, $135; T-1, $186	Service, $0; per line, $100 or telco (whichever is greater); CO: DAL, $16.40; T-1, $62; access coordination: DAL, $10.55; T-1, $21.70; port charges, $0	1 min/$75	Yes, nonvalidated, post-dialed, 2 digits; NRC, $0; MRC, $15	No	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $75; MRC, $0
Metromedia-ITT Long Distance Secaucus, N.J. (201) 333-5300	Custom WATS 75-200	75-250/$750-$2,500	DAL, T-1	Service, $50; per line, $0; CO, $0; access coordination, $0	Service, $0; per line, telco + $10; CO, $0; access coordination, $0; port charges, $10 per active circuit	6 sec/$150 per line	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $50; MRC, $0	No	Yes, MRC, $0; NRC, $0	Yes, NRC, $50; MRC, $0	Yes, NRC, $500; MRC, $100 per tape
	Precision WATS (limited availability: Fla., Texas, N.J., N.Y.)	100-1,400/ $1,000-$15,000	DAL, T-1	Service, $150; per line, $0; CO, $0; access coordination, $0	Service, $0; per line, varies by state (5); CO, $0; access coordination, $0; port charges, $0	30 sec/$125 per DAL	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $5	Yes, post-dialed, 3-4 digits; NRC, $0; MRC, 3-4 digits, $10, 4+ $20	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $250; MRC, $100 per tape

DAL = Dedicated access line
ICB = Individual case basis
MRC = Monthly recurring charge
NA = Information not available
NRC = Nonrecurring charge

All listed carriers offer termination coverage in 50 states, Puerto Rico, U.S. Virgin Islands and international areas.
Carrier billing increment is 6 seconds unless otherwise noted.

*Footnotes:

1. Validated security codes are validated codes which, unless inputted correctly, will not allow completion of dialed call, regardless of access. Equivalent to validated account codes.
2. Allnet offers 4-digit nonvalidated, as well as 2- and 3-digit validated codes. Pricing varies by number of digits and number of codes.
3. Allnet offers 2- and 3-digit validated authorization codes for special access customers.
4. Requirement varies by state: Fla., $10,000; Texas, $8,000.
5. Prices vary depending on state: DAL, N.Y., telco; N.J., $125; Fla., telco w/$400 credit per line; Texas, $125.
6. Up to 8 speed dial numbers, one speed dial package will be provided free of charge with every $300 in usage.
7. US Sprint uses a scale to determine the charges for validated account codes: 1-5 codes is $7 a month, up to 301-1,000 codes for $200 per month.
8. AT&T has a local line installation charge for its dedicated service (Charge is variable depending on length and type of line).
9. There are other WAL- and DAL-based services that are based on banded pricing plans, which are not being actively sold by the carriers and for that reason not included in this survey.
10. "Telco" refers to charges by the telco and either billed by the telco or the interexchange carrier. In either case, the customer incurs no extra fees from the interexchange carrier for this item.
11. Option 1: $20 (N.J.), $25 (elsewhere). Option 2: $45 (N.J.), $50 (elsewhere)

This chart includes a representative selection of vendors in the dedicated access line-based WATS services market. Most vendors offer other dedicated access line-based WATS services, and some vendors not included offer a full range of competitive products.

TELECHOICE, INC., MANCHESTER, CONN.

CHOOSE MICOM®

WE'LL HELP YOU MAKE THE MOST OF YOUR NETWORK

For information about MICOM products, check the appropriate box and drop this postage-paid card in the mail today.

☐ **Voice/Data** — Including Voice Digitizers and Statistical and Time-Division Multiplexors that transmit voice and data over the same line. Incorporate voice in your network practically free!

☐ **X.25** — Including PADs, Packet Switches, Communications Processors and Protocol Converters, along with a choice of powerful Network Management programs.

☐ **Multiplexors** — Including our new Fast Stat Mux, Integral Modems and ISUs, Concentrator Switches, and a variety of size and operation options, including Sync/Async, Wideband and Multidrop.

☐ **INSTANET** — Including Ethernet Gateways, Data PABXs and Local Data Distribution Products, along with menu-driven Switch Management and PC-to-PC Networking programs.

☐ **General Product Catalog**

For additional information or inquiries, call our Toll-Free Applications Hotline.

1-800-MICOM US

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY/STATE/ZIP _____

PHONE ( ) _____ EXT. _____

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 906 SIMI VALLEY, CA

POSTAGE WILL BE PAID BY ADDRESSEE

MICOM Communications Corp.
4100 Los Angeles Avenue
Simi Valley, CA 93063-9949

HOW TO TELL A CLEVER X.25 FROM A NOT-SO-CLEVER ONE.

If you're a network manager, you can't do any better than the system you manage.

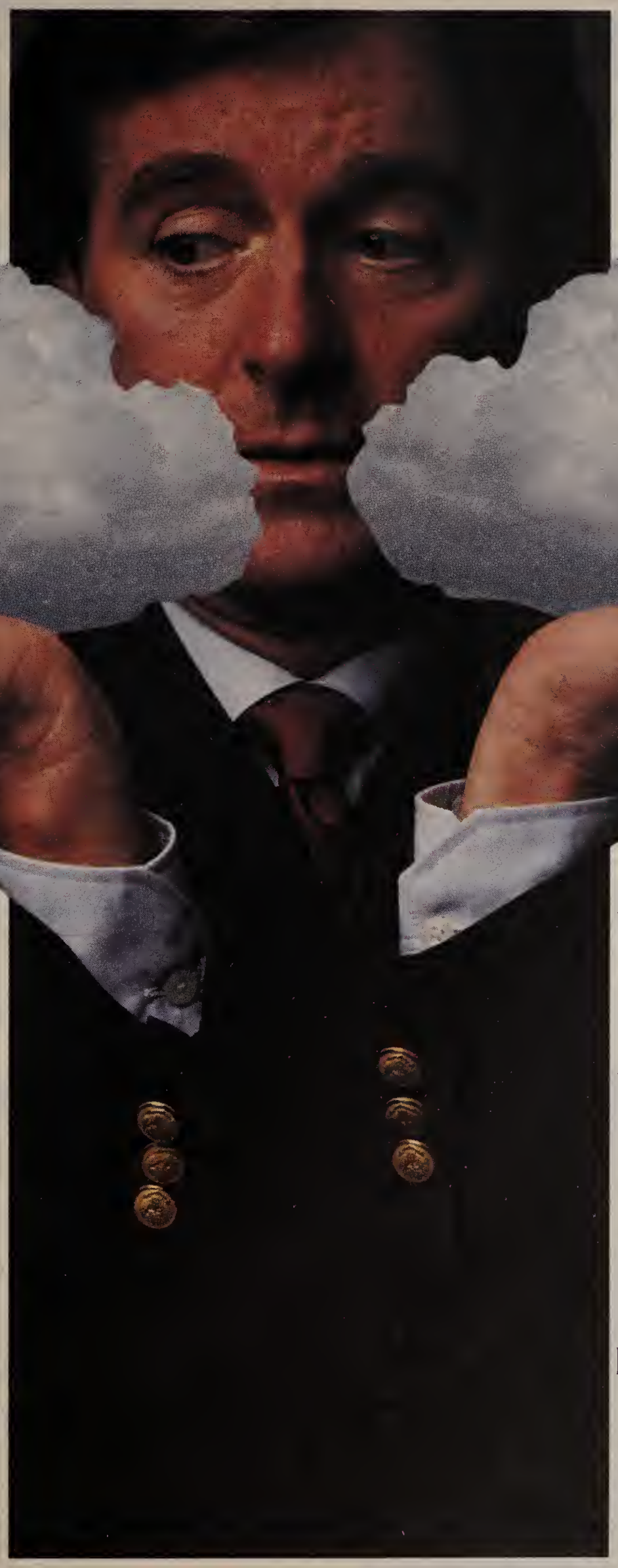
That's why you need a clever X.25 network by your side. One that will streamline your work, make it easier. The way MICOM's X.25 does.

Its intelligence, not surprisingly, stems from its brain: our XNMS network management system.

It gives you intuitive color displays of your entire network's condition. Displays that are in *real time*. Together with a hot-key functionality between program levels, that helps you to move quickly from finding problems to fixing them.

Besides configuration and fault management, our XNMS gives you performance monitoring and call accounting. While it automatically generates comprehensive reports on all activities in the network.

But MICOM's X.25 intelligence doesn't end there. We have a complete line of X.25 equipment (PADs, packet switches and bridge-routers) all bright enough to connect a wide range of products and protocols:



Async, Bisync, SNA, HDLC, X.25, FAX, even multiple LAN networks.

Any X.25 network that can't do these things for you unfortunately falls into the not-so-clever category.

So when it's time to choose, pick an X.25 system with brains. From a company that has nearly two decades of success linking everything from simple point-to-point systems to complex networks.

In other words, MICOM.

After all, a clever network manager deserves a clever network.

FREE X.25 SEMINAR.

Learn what MICOM's powerful X.25 systems can do for you at an intensive, day-long seminar.
Call 1-800-MICOM U.S.

(805) 583-8600
FAX (805) 583-1997

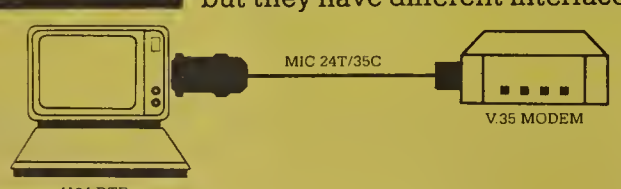
MICOM®
NETWORKING SOLUTIONS

See the FAXNeT Form on Page #108

DATA COMMUNICATIONS

RAD TO THE RESCUE.

THE PROBLEM: You want to connect two devices, but they have different interfaces.



THE SOLUTION: RAD's miniature interface converters translate one interface into another.

Eleven models are available to convert between any two of the following interfaces: RS-232 (V.24), V.35, RS-422 (V.36), X.21. The interface converters operate without AC power and are complete with cable and connectors for immediate installation.

From the growing Rad family.

data communications ltd.

U.S. Headquarters
151 West Passaic St., Rochelle Park, NJ 07662, Tel: (201) 587-8822, Telex: 6502403647 MCI, Fax: (201) 587-8847

Circle Reader Service No. 1

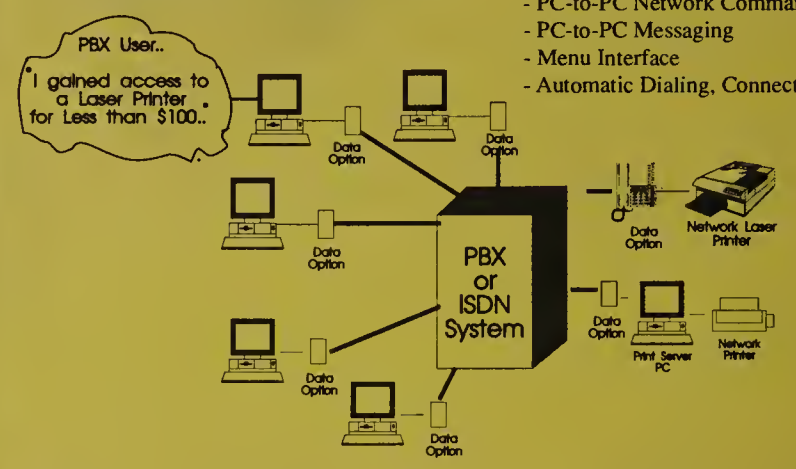
PC COMMUNICATIONS SOFTWARE

New low-cost PBX and ISDN
Communications Software For PCs

Your PBX or ISDN Can Share PC Resources using **AutoPRINT**[tm] or **Easy**LAN[tm]

AutoPRINT Printer Sharing Software
- Share Network Printers
- Automatic, Nothing New To Learn

EasyLAN PC Resource Sharing Software
- Share Network Printers, Automatically
- PC-to-PC File Transfer
- PC-to-PC Network Commands
- PC-to-PC Messaging
- Menu Interface
- Automatic Dialing, Connection Directory



No special hardware required, your PC's standard communications port is linked to the Data Option. Speeds up to 56,000 are supported. **Its easy to install.** Install it during your coffee break.

The Following Systems are supported by: **AutoPRINT** **EasyLAN**

ISDN	**yes**	**yes**
Northern Telecom SL/1	**yes**	**yes**
Rolm CBX	**yes**	**yes**
Siemens	**yes**	**yes**
David Systems	**yes**	**no**
Price per PC	**$79 to 149**	**$99 to 189**

Call Toll Free 800/835-1515 for:
Free Literature or To Order
Free Consultation
Free Trial Installation Details

Server Technology 2332-A Walsh Santa Clara, CA 95051, Tel 408/988-0142, Fax 408/738-0247

Circle Reader Service No. 2

ANALYZE DATA LINE PERFORMANCE

Analyze Data Line Performance

The PC-based PA1 Performance Analyzer lets you analyze over 35 network parameters using easy-to-read color graphics and printed reports. Response time, exception and over-threshold reports help you quickly find problem areas. Line utilization data reveals overloaded equipment and underused capacity.

Know what's happening on your data lines. Call us for our PA1 demo or a 15-day free product trial.

- **Reveal utilization trends.**
- **Measure response time.**
- **Plan network evolution.**
- **Troubleshoot contention problems.**
- **Evaluate transaction impact.**
- **Analyze network changes.**
- **Choose SNA, Bisync, X.25, or Burroughs poll/select.**

Progressive Computing, Inc.
814 Commerce Drive, Suite 101
Oak Brook, IL 60521-1919 USA
(708) 574-3399 FAX (708) 574-3703

Circle Reader Service No. 3

CSU

Upgrading to ESF on your T-1 circuits?

We'll give you $500 for your old CSUs

1-800-669-4278

VERILINK®
Authorized Distributor

The Helfrich Company 19782 MacArthur Boulevard Irvine, California 92715

Circle Reader Service No. 4

TOKEN RING SOLUTIONS

GIVE US A TOKEN ORDER.

Discover CSP, the single source vendor that supports your Token Ring LAN with quality products, a staff of experienced professionals and a commitment to service.

Save time, money and hassles. CSP delivers the right product for your network and computer cabling requirements with quick turnaround and timely delivery on standard and custom orders. And our perfect product guarantee assures quality on everything you order.

Call for more details on how we can help. Give us a token order and make CSP your most important connection.

Computer System Products INCORPORATED™
14305 21st Avenue North Minneapolis, MN 55447
(612) 476-6866
1-800-4-CABLES

Circle Reader Service No. 5

DIAL-UP MANAGEMENT

Dial-up Network Management for the 1990's

We have stand alone systems for the small users, (8 modems) and PC based systems for the large users, (up to 960 modems), operating in 10 countries since 1984.

See us at INTERFACE '90, 1075

CDI

Communication Devices Inc.
Clifton, NJ 07011
Phone: 201 772-6997
Fax: 201 772-0747

Circle Reader Service No. 6

DS/1 TESTING

Get Dual-Line T1/DS1 Monitoring and Signaling Analysis

The Model 5110

- Dual Line Performance Monitoring
- Signaling Bit and Traffic Displays
- Controlled Slip Estimation
- Channel Access Features
- Wink Measurement
- Dialed Digit Display

Call For More Information: 1-800-TAU-TRON

10 Lyberty Way
Westford, MA 01886
(508) 692-5100 • 1-800-828-8766
Fax (508) 692-1938 • Telex 750245

tau-tron The Quality Tester

Circle Reader Service No. 7

DATACOMM MATRIX SWITCH

NEW DIMENSIONS
Distributed Tandem Matrix Switch

LARGEST CAPACITY Smallest Size lowest cost

MTRX-500	512 Ports up to 64 Kbps	7½"
MTRX-4000	4096 Ports up to 64 Kbps	15"
MTRX-8000	8192 Ports up to 64 Kbps	28"

Salient Benefits:

- Fractional T-1, from 64 Kbps to 2.048 Mbps
- 98% Cable Reduction, Twisted Pair 4000 ft DTE to DCE
- LAN-based PC Control - Ethernet or Token Ring
- NetView PC or Cincom NetMaster Universal Workstations
- User-Controlled Database - dBase III PLUS or dBase IV
- Integral BERG/BERT and S.A.M. Test Functions
- 30,000 ports installed at RBOCs and Fortune 1000 Companies

Datacomm Management Sciences Inc.

"The Responsive Ones"
Norwalk, CT 203-838-7183
FAX: 203-838-1751

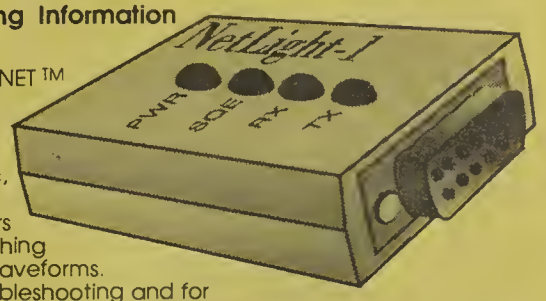
Circle Reader Service No. 9

ETHERNET LINE MONITOR

NetLight-1

ETHERNET ™ / IEEE 802.3 Attachment Unit Interface Line Monitor

- Provides On-Line Network Status Indication
- Provides Valuable Troubleshooting Information
- Easy to Install



NetLight-1 is a line monitor for the ETHERNET ™ or IEEE802.3 Attachment Unit Interface. It is available in two versions. Version A provides LED's that indicate when a station is transmitting, receiving, or experiencing a Signal Quality Error. Version B provides these same indicators and also provides connectors for attaching an oscilloscope to monitor the signal waveforms. This simple device is useful for both troubleshooting and for providing immediate feedback of network status to the station operator.

For Additional Information or to place your order for Netlight-1 please call 1-800-525-2141 or contact:

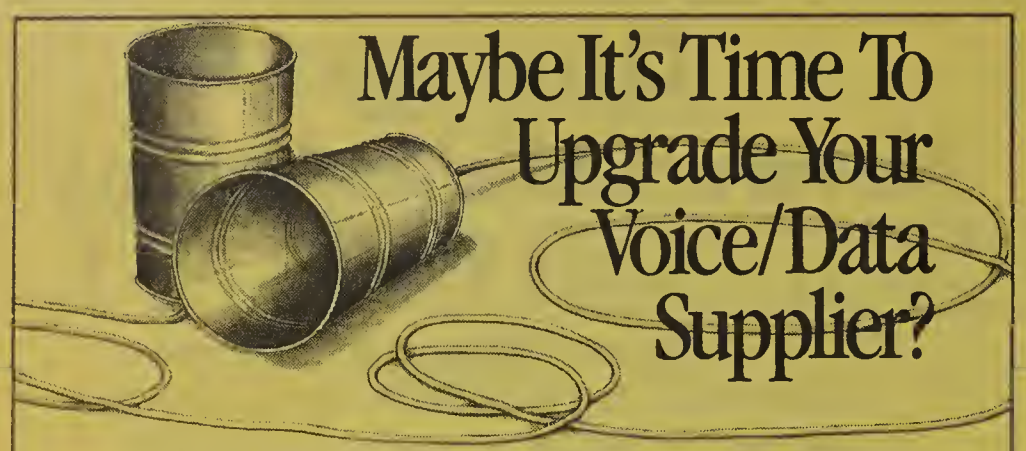
Knowledge Implementations, Inc.

32 Conklin Road, Warwick, New York, 10990 (914)986-3492 FAX (914)986-6441

Dealer and OEM Inquiries Welcome
Quantity Discounts Available
Visa and MasterCard Accepted
In Stock for Immediate Delivery

Circle Reader Service No. 8

FREE VOICE/DATA CATALOG



Maybe It's Time To Upgrade Your Voice/Data Supplier?

Introducing "The Genie Group," a nationwide network of 17 local distributors with 47 stocking locations near you. Send for your *free*, fully photo illustrated system approach catalog. This one source buyers guide offers the broadest selection of voice/data products available today.

THE **GENIE GROUP**, INC.
1325 Roelke Drive (901) 345-9590.
South Bend, IN 46614

It's not magic, it's just good business.

Free Voice/Data Catalog

Circle Reader Service No. 10

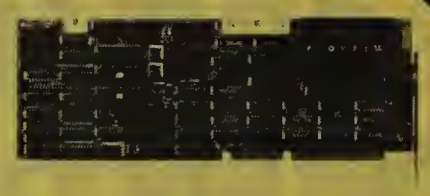
LAN AND WAN CONNECTIVITY

PLUG YOUR PC/AT DIRECTLY INTO HIGH-SPEED DIGITAL SERVICES.

NEW

PROMPTUS T-1 ACCESS MODULE

AT Bus-compatible WAN Adapter



On Board T1 CSU/DSU

- Provides fully integrated access to
  T1: 1.544 Mbit/s
  FT1: 56 to 1536 Kbit/s
  CEPT: 2.048 Mbit/s
  Primary Rate ISDN
  Switched 56 with T1 Access
- Greatly reduces network file transfer time.
- Includes X.25 file transfer software.
- Plugs into single 16-bit PC/AT slot.
- On board CSU/DSU eliminates external equipment, lowers costs.
- Applications include network gateways, routers, LAN bridges, facsimile servers, switches, graphic file transfer and more.
- Efficient shared memory interface.

Call or write for complete information:

P R O M P T U S

Promptus Communications, Inc.
Portsmouth Business Park, Portsmouth, RI 02871
Tel: (401) 683-6100 FAX: (401) 683-6105

Circle Reader Service No. 11

INTELLIGENT MULTIPLEXER

COASTCOM

Finally, a T1-MUX that can grow when you grow.

Now there's a network solution that can easily adjust to a variety of network sizes. Introducing the T1M-III℠ - an intelligent T1M-III DSU/CSU from Coastcom. It's the newest member of our StepNet℠ family - networking products that let you add on equipment as you need to. The T1M-III is perfect for high speed 1.544M computer/telco interfacing and fractional T1 services. It can deliver electronic mail, DDS, LANs, CAD/CAM files and much more. Across town or across the world.

COASTCOM
2312 Stanwell Drive,
Concord, CA 94520
Tel (800) 433-3433;
in CA (415) 825-7500

Circle Reader Service No. 12

NETVIEW-NET/MASTER NETWORK MANAGEMENT

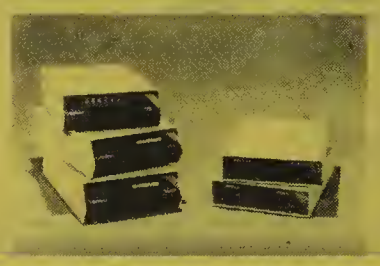
NetView Goes To NEW Places

With NetQuest's new products, NetView is going where it has never been before. NetQuest introduces a new way of using standard NetView (or Net/Master) modem and DSU/CSU management in network configurations not manageable until now.

NetQuest Expands NetView Management Into:

- **SNA/LPDA lines with non-IBM modems or DSU/CSU's.**
- **Unisys, DEC, CDC or other non-SNA host's sync and async lines.**
- **Remote IBM AS400, System 38, Series 1 and similar lines.**
- **SNA over X.25 lines (SNA, NPSI and QLLC).**

NetQuest transmission products link directly to NetView (NCP) and are not NetView PC based. They perform LPDA diagnostics and functions necessary to allow non-SNA networks to transmit NetView LPDA messages.



V.32 MODEMS
LDM's
DSU/CSU's
LPDA CONTROLLERS

NetQuest Corporation
129H Gaither Drive, Mt. Laurel, NJ 08054
(609) 866-0505 • FAX (609) 866-2852

NetView® is a registered trademark of IBM Corporation.
Net/Master® is a registered trademark of Cincom Systems, Inc.

Circle Reader Service No. 14

NETWORK SCANNING AND MONITORING

Cable Scanner

Pinpoint Network Cable Faults Fast!

The Scanner is a monitor, fault finder, cable locator and much more. Helps you pinpoint the location of shorts, opens or breaks. Its 32 character display reports the fault in plain English "short at 306 ft". With an oscilloscope, Scanner's high speed, pulse generating circuitry gives a detailed view of the entire LAN including transceiver, terminator and multiple faults.

- * Cable length measurements
- * Locate breaks, shorts, opens, bad crimps, etc.
- * LAN activity monitoring
- * Find cables in ceilings, walls, floors
- * Cable TV troubleshooting
- * Generate as-built drawings and specifications
- * Isolate faulty network interface cards
- * Very simple to operate

Included is Tracer for locating exactly where in the floor, ceiling, wall or patch panel the cable lies. Cable Scanner, Tracer and Operators' Manual are only $1495.

Circle Reader Service No. 13

M-Test Equipment
P.O. Box 460008
San Francisco, CA 94146-0008

Call for info

Outside CA: (800) 334-4293
Inside CA: (415) 861-2382
FAX: (415) 864-1076

Send For Free Info

NW Feb 90

For more information on any of the products and services advertised in *NetworkWorld's ActionCenter*, circle the Reader Service Numbers on this coupon which correspond to the advertisement of interest to you.

Complete the coupon information and mail to:
NetworkWorld
P.O. Box 5090, Pittsfield, MA 01203

Expires 5/31/90

Name _____
Title _____
Company _____
Phone ( ) _____
Street _____
City _____
State _____ Zip _____

NW Feb 90

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41
42 43 44 45 46 47 48 49
50 51 52 53 54 55 56 57

Send for free information

For more information on any of the products and services advertised in *Network World's* Action Center, circle the Reader Service Numbers on this card which correspond to the advertisements of interest to you.

Complete the coupon information and mail to: NETWORK WORLD
The Newsweekly of Enterprise Networking Strategies

(Feb. Expires May 31, 1990)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	
34	35	36	37	38	39	40	41	
42	43	44	45	46	47	48	49	
50	51	52	53	54	55	56	57	

Name_____
Title_____
Company_____
Street_____
City_____
State_____ Zip_____
Phone_____

Send for free information

For more information on any of the products and services advertised in *Network World's* Action Center, circle the Reader Service Numbers on this card which correspond to the advertisements of interest to you.

Complete the coupon information and mail to: NETWORK WORLD
The Newsweekly of Enterprise Networking Strategies

(Feb. Expires May 31, 1990)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	
34	35	36	37	38	39	40	41	
42	43	44	45	46	47	48	49	
50	51	52	53	54	55	56	57	

Name_____
Title_____
Company_____
Street_____
City_____
State_____ Zip_____
Phone_____

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 716 PITTSFIELD, MA

POSTAGE PAID BY ADDRESSEE

NETWORK WORLD

The Newsweekly of Enterprise Networking Strategies

P.O. Box 5090
Pittsfield, MA 01203-9838

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 716 PITTSFIELD, MA

POSTAGE PAID BY ADDRESSEE

NETWORK WORLD

The Newsweekly of Enterprise Networking Strategies

P.O. Box 5090
Pittsfield, MA 01203-9838

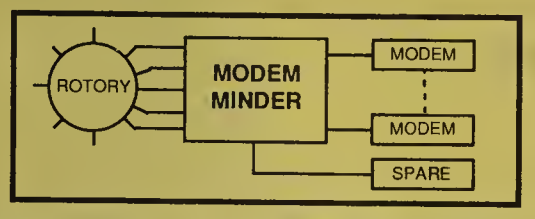
PREVENT HUNTGROUP LOCKOUT

Lost Calls = Lost $

RING - NO - ANSWER PROBLEMS SOLVED!

Dataprobe's Modem Minder detects failures in modem hunt groups and automatically takes corrective action.

Automatic Switching to Spare Modems or Busy-out Defective Modems.



Low Cost **Expandable** **Ideal for 800#s**

dataprobe INC.

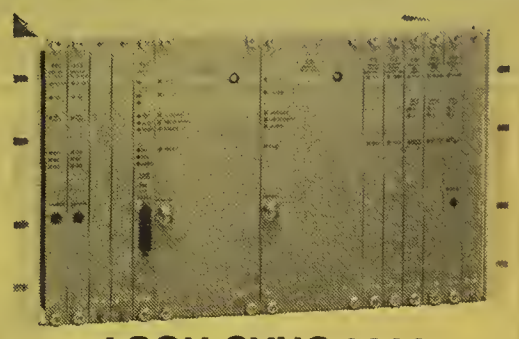
170 COOLIDGE AVENUE
ENGLEWOOD, NEW JERSEY 07631
(201) 569-6464 FAX (201) 894-0939

Circle Reader Service No. 20

TIMING SIGNAL GENERATOR

NETWORK SYNCHRONIZATION INTERFACE

- Isolates From Reference Faults
- Clean, Accurate Output
- Monitors Network Performance



ACCU-SYNC 3800 Timing Signal Generator

The ACCU-SYNC 3800 ideally meets synchronization requirements of private networks. Captures average frequency and isolates from interruptions, jitter and wander of DS1 or 56 kb/s reference. Gracefully accepts Cesium, Loran, GPS or WWVB as primary or secondary Stratum 1 source. ACCU-SYNC3800 – it's the answer.

For more information call :

FTS / AUSTRON INC
TELECOM PRODUCTS GROUP

AUSTRON, INC
P.O. Box 14766
Austin, TX 78761-4766
(512) 251-2313
FAX (512) 251-9685

AUSTRON, INC.
1930 Isaac Newton Sq. Suite 111
Reston, VA 22090
(703) 471-7963
FAX (703) 689-4684

FTS, INC.
34 Tozer Road
Beverly, MA 01915-5510
Toll Free 1-800-544-0233
FAX (508) 927-4099

Circle Reader Service No. 16

PROTOCOL ANALYZER

Omni I/O™

PC Based Protocol Analyzer

$495

- Fast, friendly user interface. Excellent data visibility.
- Integrated data capture, analysis, DOS file storage. Named configurations, formatted print.
- Async, Sync, BOP's (SDLC, X.25, etc.), Transparent, ASCII, EBCDIC, IPARS, user defined.
- Fits PC, AT compatible, 386 and Laptop with standard bus and CGA, EGA or VGA.
- Programmable - API ($695) for unprecedented power and flexibility.

Circle Reader Service No. 17

COMPUTRONICS Romney, WV 26757

P.O.Box 2040, 151-C Jersey Mt. Road, Romney, WV 26757 • 304-822-3086

TOKEN RING

Anyone Can Promise You a 16Mbps Token Ring Bridge.

But we can deliver.

Why wait around for 16 Mbps performance in a 100% IBM compatible Token Ring bridge, when you can get it today. From Netronix. In fact, our newest TokenMaster® bridge is the fastest, easiest to configure, source routing, 16 Mbps Token Ring bridge you can buy. Including Big Blue's. So why wait, call Netronix today at **1-800-282-2535** (in CA, 1-707-762-2703) or FAX your order to 1-707-763-6291

Netronix Technology That Works.™

Circle Reader Service No. 18

TEST EQUIPMENT

A BREAKOUT BOX BUILT TO LAST– GUARANTEED!

- 100 red/green indicators
- Built-in pulse traps
- +/– output voltages
- Null-modem switches
- Lifetime warranty

PRICE: $195.00

Circle Reader Service No. 19

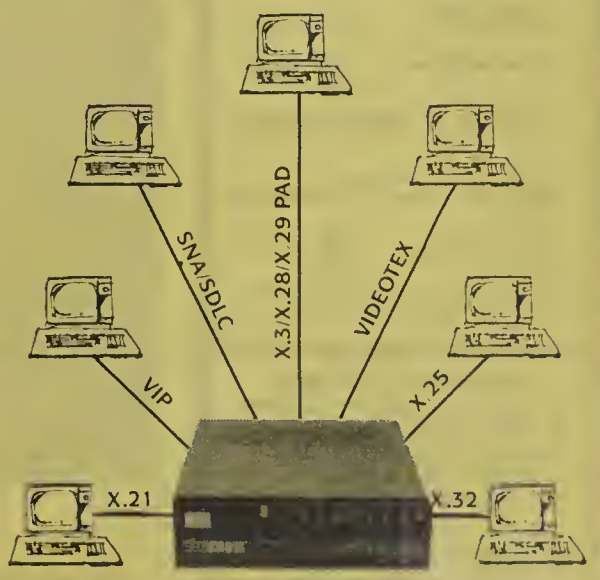
Electrodata, Inc.
23020 Miles Road
Bedford Heights, Ohio 44128-5400
Call Toll-Free 1-800-441-6336
(216) 663-3333 TWX: (810) 427-2280
FAX: (216) 663-0507

X.25 NETWORK CONNECTIVITY

ONE UNIT. MULTIPLE CONNECTIONS.

OST, Inc. developed the PASS 25 to meet the demands of their end users by providing multiple connections in one unit. The PASS 25 is a multi-protocol X.25 switch that reduces network overhead costs by allowing systems that use different protocols to utilize the same transport network.

The PASS 25 supports multiple protocols including CCITT X.25, X.21, X.32, Videotex PAD, CCITT X.3, X.28 and X.29 PAD, VIP and SNA SDLC. V.24 V.28, V.35, and V.11 physical line interfaces are available. The unit handles from 2 to 18 ports with the option of upgrading in 2 channel increments. To increase your networking options, call OST today!



OST

OST, Inc.
14225 Sullyfield Circle
Chantilly, Virginia 22021
(703) 817-0400

Circle Reader Service No. 15

Demonstration model will be presented at ComNet Exhibit 1175 1177 and Interface Exhibit 950.

NETWORKING MARKETPLACE

DATA COMMUNICATIONS

VSAT NETWORKS

VSAT BUYER'S KIT™

Join the legion of other network buyers worldwide who have taken advantage of the time and money saving potential of this unique document.

WHAT VALUE DOES THE VSAT BUYER'S KIT™ OFFER?

- Written by experts in VSAT network design and implementation. Covers data, video and voice VSAT networks.
- A rigorous and detailed procurement document that will protect you, the buyer, without eliminating any qualified vendors.
- A complete set of background information to provide the basic knowledge that you need in understanding VSAT networks and in preparing appropriate presentations for your management.
- Specific information regarding total life cycle cost, current VSAT users, consultants in the field, qualified vendors, and many other issues necessary to successful VSAT network planning and procurement.
- Potential savings of many thousands of dollars in both consulting fees and your staff time. Use your consultant as an advisor, not a paper mill.
- 267 pages of hard copy and on diskette in either WordPerfect or WordStar.

AVAILABLE ONLY FROM ICOM STRATEGIES.
FOR DETAILED BROCHURE CALL 407-259-5880.
See the FAXNeT Form on Page #108

PRICED AT $1,395.00
AVAILABLE FOR IMMEDIATE DELIVERY

ALSO FROM ICOM STRATEGIES
- ☐ Local Area Network Buyer's Kit™ (Future)
- ☐ Disaster Recovery Buyer's Kit™
- ☐ ISDN Buyer's Kit™ (Future)
- ☐ Video Conferencing Buyer's Kit™
- ☐ Network Management Buyer's Kit™ (Future)

ICOM STRATEGIES

478 Ballard Drive
Melbourne, Florida 32935

Telephone 407-259-5880

SELL OR TRADE YOUR SURPLUS
modems, mux's, data pbx, etc.

REPAIRS • UPGRADES • INSTALLATION • CABLING
MICOM codex
paradyne AT&T
IBM Racal-Milgo
ARK CASE Datatel
Universal Data Systems
general datacomm
NEW AND USED EQUIPMENT BACKED BY WARRANTY
NATIONWIDE SERVICE MAINTENANCE AND INSTALLATION

we need to buy
- ***TIMEPLEX MULTIPLEXORS***
- ***UDS 208 AB MODEMS***
- ***CODEX 208 AB MODEMS***
- ***MICOM BOX 2 MUX'S***
- ***GDC MEGA SWITCH***

call us...

(201) 586-3070 FAX 586-3080

Warwick DATA SYSTEMS, INC.
66 FORD ROAD, DENVILLE, NEW JERSEY 07834

T-1

CSU's-D4/ESF
CSU/DSU's
AUTOMATIC
PROTECTION SWITCHING
ENCRYPTION
TEST EQUIPMENT
D-4 CHANNEL BANKS
SYNCHRONIZATION SYSTEMS
PROTOCAL CONVERTERS
REPEATERS, SMART JACKS
DSX, PATCH PANELS

IN STOCK
ALL AT
COMPETITIVE PRICES

TA DATA GROUP LTD.
4 GURNEE COURT
NEW CITY, N.Y. 10956
914-354-8879
FAX 914-362-3328

YOUR TOTAL LINK TO TELECOMMUNICATIONS PRODUCTS

RJE FOR PC's

Complete Bisync 2780/3780 and SNA 3770 RJE emulation for PC's and PS/2's. Execute batch jobs automatically to or from your IBM host in JES2/3. **Featuring...**

- IBM Mdl 3777-1 support
- Up to 19.2K bps thruput
- Unattended operations
- Printer, card punch and console support
- Data compression and transparency
- PC-to-PC connectivity

Full warranty • ***immediate delivery***

From as *low as* $249
Call (800) 767-4844 today!

Interface

Special Interface Show Issue - March 5th

Closes: February 21st

Bonus Show & Hotel Distribution

Call for further information on advertising in this Special Issue.

NETWORK WORLD Classified Advertising

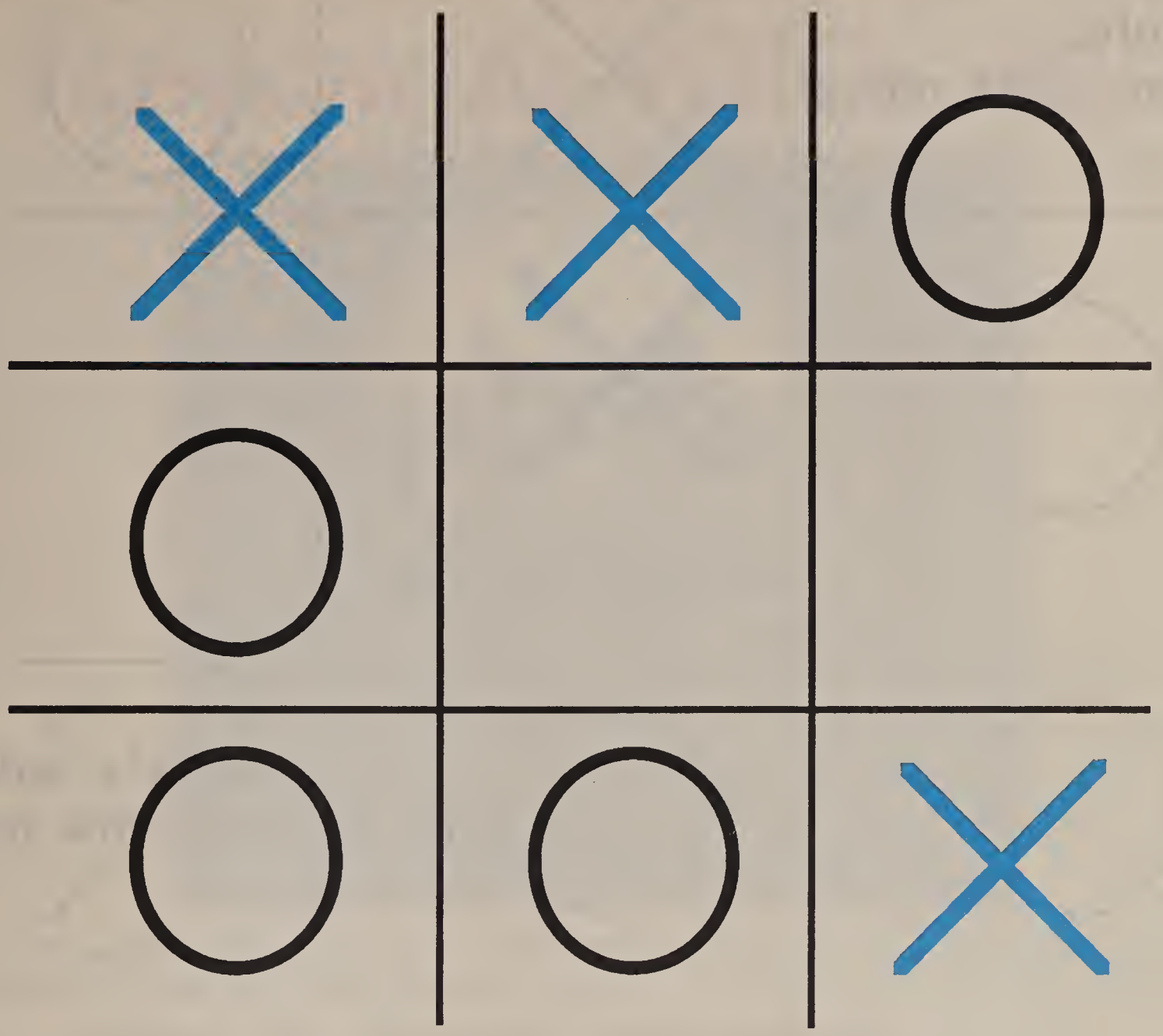
Joan Pinsky, 161 Worcester Road,
Box 9172, Framingham, MA 01701-9172

Susan Egan, 18004 Sky Park Circle, Suite 100, Irvine, CA 92714

1-800-622-1108; (In MA): **508-875-6400**
Pacific & Mountain: **714-250-3006**

The following advertisers appear on the FAXNeT form on page #108:

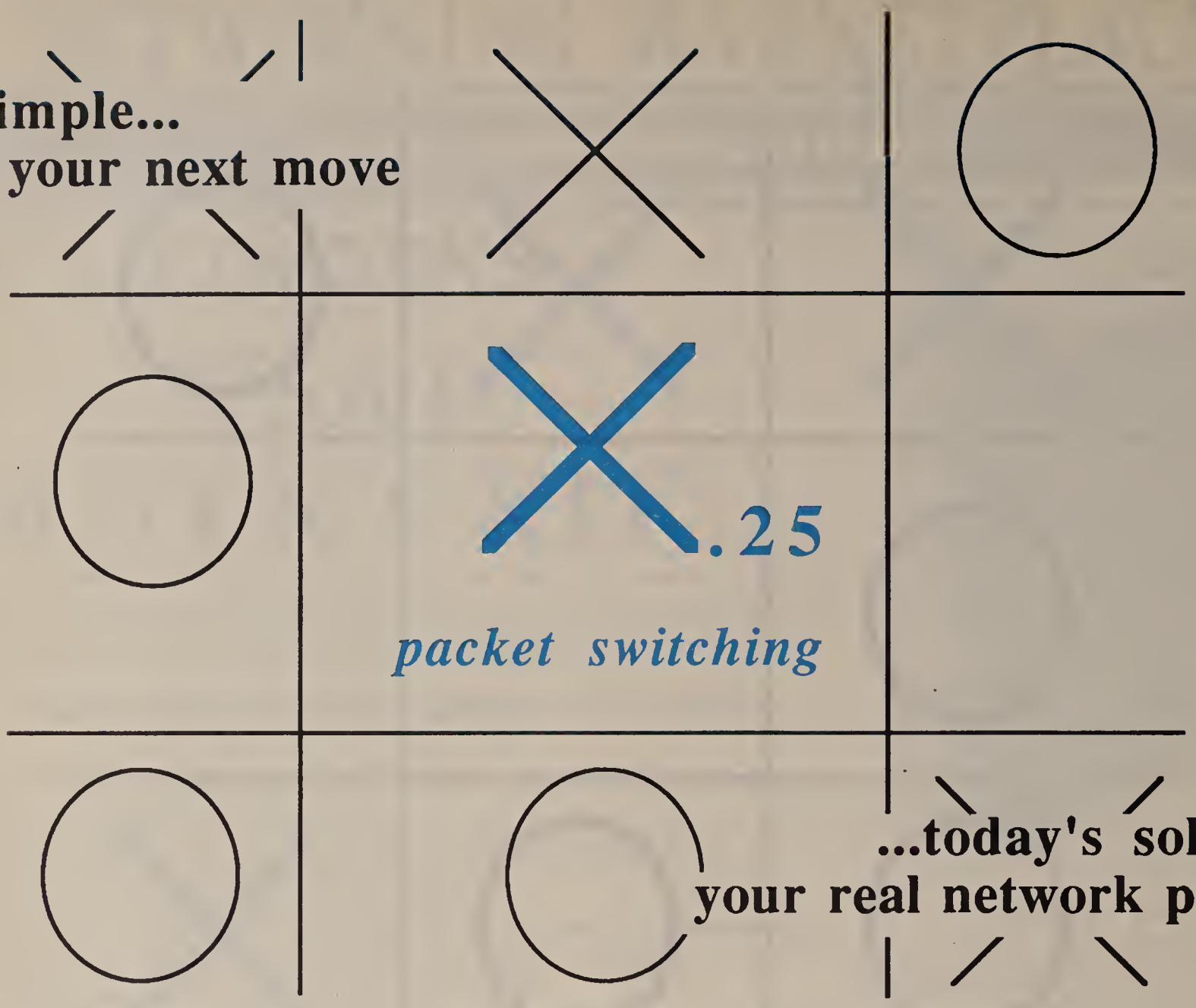
Amnet
General Tech
ICOM
Teletutor
VOICE 90
Warwick Data Systems



What's your next move?

See the FAXNeT Form on Page #108

See Us At Comnet Booth #1714



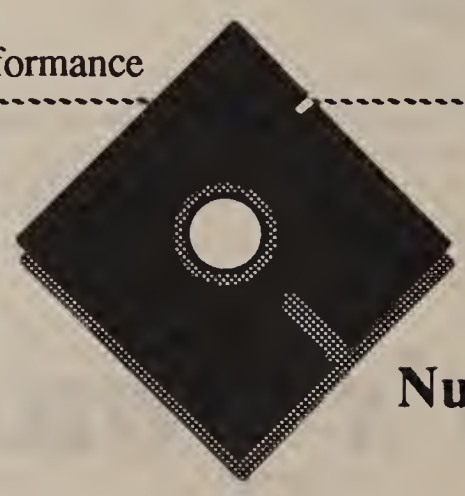
It seems like the game of Tick-Tack-Toe has been around forever. And that's what you intend your network solution to be - around forever. But selecting a network is a lot more complicated than a game of Tick-Tack-Toe and making the right move is crucial. So if your game plan is to move your data communications over a private X.25 packet switching network...then, play the game with AMNET.

Recognizing the facts that today's PC is breaking last year's performance expectations, that next year's PC knows no barrier, and that the PC is here to stay - AMNET harnessed the power of that PC. And can offer you all the features and connectivity advantages of large, expensive X.25-based networks using the PC/AT as its platform. But at a fraction of the price!

The Nucleus 7000 Series products provide an X.25 packet switching solution with extensive network management capabilities and high throughput. Our design gives you the flexibility to connect a variety of products and protocols (X.25, SNA/SDLC, Async, 3270 Bisync, and 2780/3780 Bisync).

Our PC/AT-based Network Manager puts you in control. It gives you real-time, full-color displays of your network's configuration and condition. And keeps you in control by alerting you to your network's condition through audible alarms. It also gives you performance monitoring, call accounting, and reports on your network's activities.

So when it comes time to chose your final game plan, make the right move, pick -



FREE!

Nucleus 7000 Series Demo Disk

If you're still not sure of your next move - call AMNET today to order your "free" disk. It will provide you with a valuable overview of what our Nucleus 7000 Series products can do to solve your network requirements.

Hurry, don't wait - call:

1-800-821-0167

Ext. 199

or

508-879-6306

(outside the U.S.)

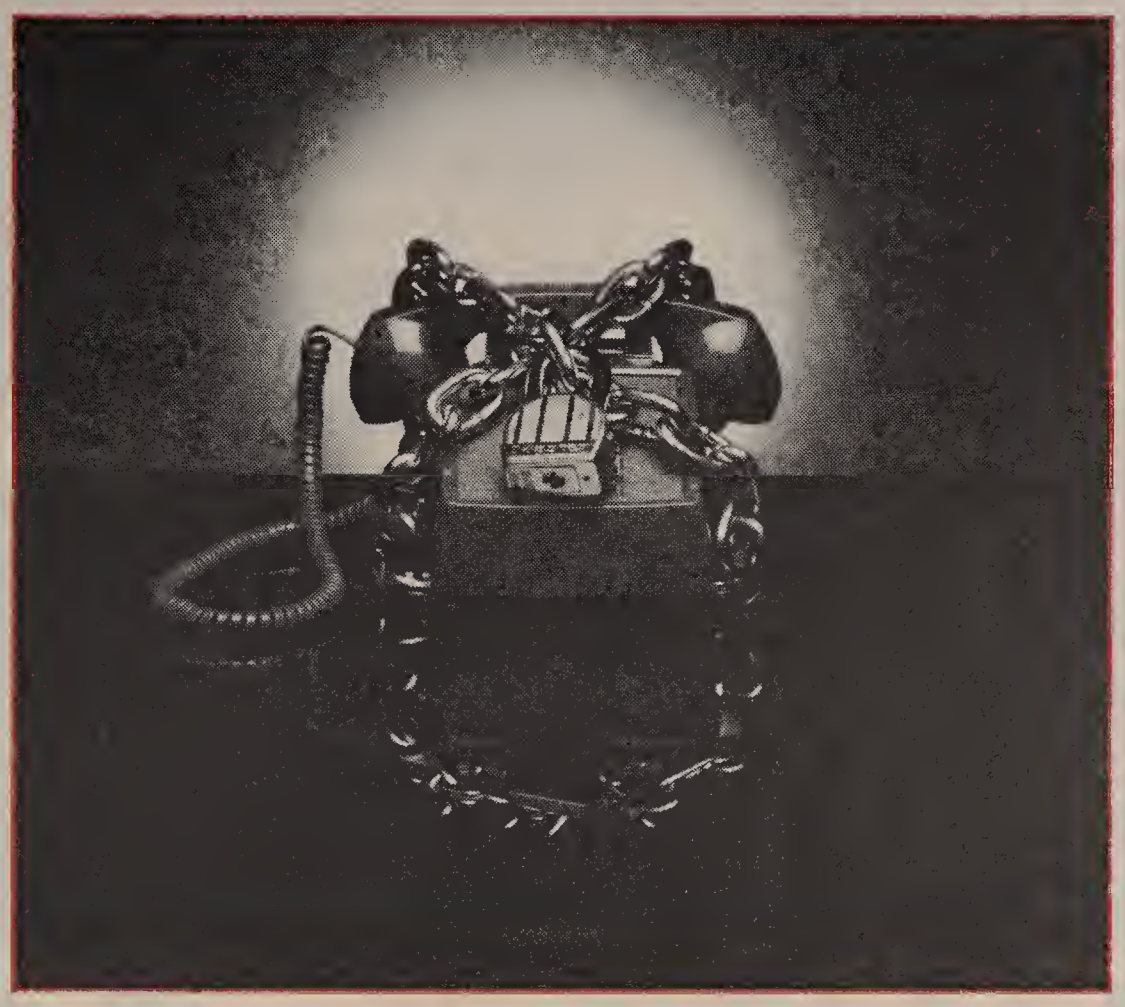
AMNET

1881 Worcester Road
Framingham, MA 01701

See the FAXNeT Form on Page #108

See Us At Comnet Booth #1714

UNLOCK THE POTENTIAL OF YOUR TELEPHONE AT VOICE '90!



Unlock the potential of your telephone at VOICE '90. Using simple voice processing products, and touch-tone inputs, your phone system can now:

- ***Automate sales, order entry and customer service calls.***
- ***Deliver information to multiple destinations with one phone call.***
- ***Accept and verify credit card purchases automatically.***
- ***Use voice mail boxes to communicate 24 hours a day.***
- ***Access vital information from any database.***
- ***Allow customers to route their own calls.***

VOICE '90 delivers 33 conference sessions, ten tutorials and a 60,000+ sq. ft. exposition hall, where you will see hundreds of the most innovative applications in call processing and voice processing — all designed to save time and money and increase productivity. Test all the newest equipment and services under one roof. Walk away with the latest cost-saving and productivity applications of these exciting new technologies.

Attend The Third Annual

VOICE '90

Conference & Exposition

Anaheim Convention Center
March 28 - 30, 1990
(Tutorials...March 27)

The largest applications showcase in the world for voice and call processing products, systems, applications, service and technologies. To receive more information or to register, call

1-800-888-2188

NET-F

VOICE '90 — Information Publishing Corp. • P. O. Box 42382 • Houston, Texas 77242 • 713-974-6637 • Fax: 713-974-6272

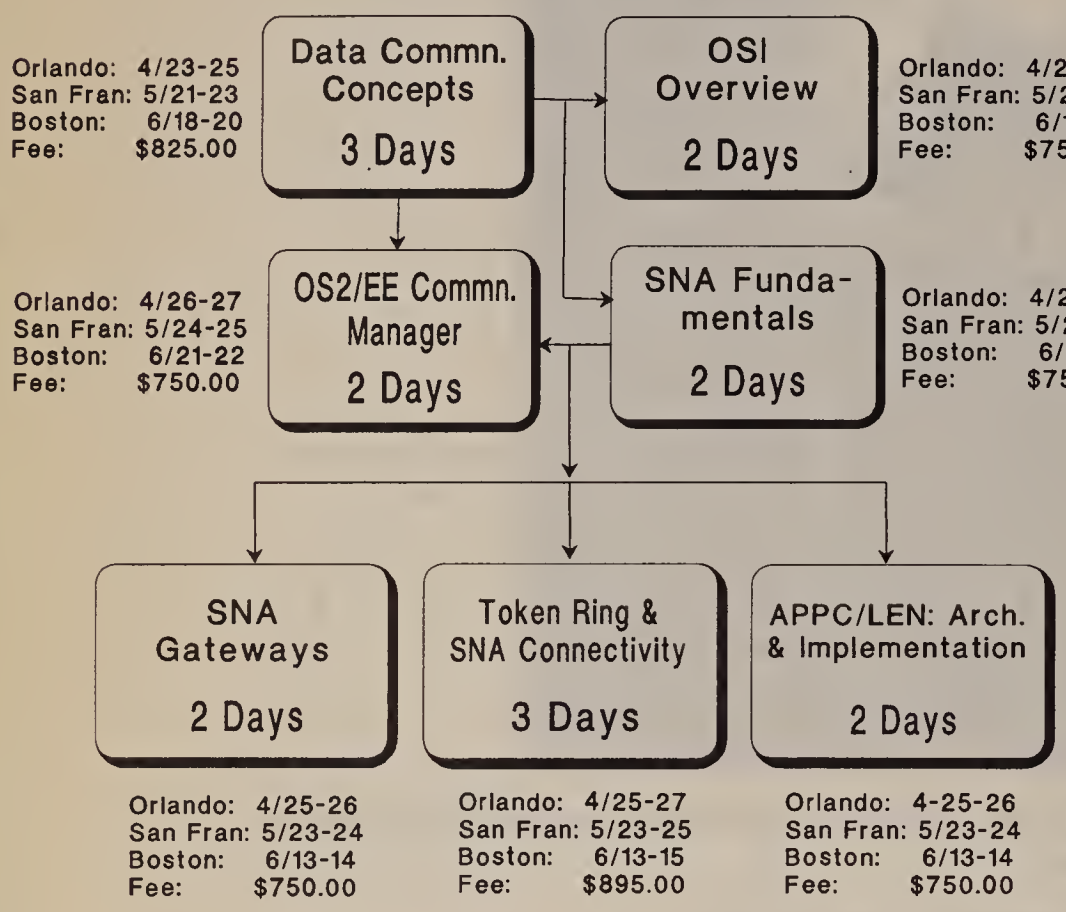
See the FAXNeT Form on Page #108

SEMINARS

Kaptronix Seminars
(Spring 1990)

Networking & Interoperability with IBM systems

7 State of the art programs



Call (201) 769-4250

Kaptronix, Inc., 332 Lincoln Drive, Haworth, NJ 07641

Over 10 years of excellence in education and consulting

NetView Integration Applications

Development in less than a week?

As simple as filling in a menu screen?

At a cost that would surprise you?

Assistance in value-added host features?

Shouldn't you look at **NetKap***?

NetKap:

* A menu driven NetView/PC application generator
* OS/2 EE based, no DOS constraints
* Customization for special hardware drivers available
* AT&T Accumaster Integrator Interface available

* NetKap is a trade-mark of Kaptronix

Contact: Doug O'Hearen,
(201) 769-4250

Kaptronix, Inc.
332 Lincoln Drive, Haworth, NJ, 07641

TRAINING

IN-DEPTH SEMINARS
Basic & Advanced Training in the IBM Enterprise Networking Standards for the 90's

IBM SNA/LU 6.2 APPC

Feb. 5-9 Seattle Area
Feb. 26-Mar. 2 San Fran. Area
March 12-16 Wash. D.C. Area
March 26-30 Los Angeles Area
For other cities & dates call:
Galaxy Consultants
17235 Buena Vista Avenue
Los Gatos, CA 95030
408 354-2997
FAX: 408 354-2365

TELETUTOR TELEPHONE NETWORK Course
The best computer-based training in the business

TELEtutor®

TELECOMMUNICATIONS TRAINING SERIES
For FREE catalogue of all our courses call
800-542-2242
(603) 433-2242

Interested In Advertising In Network World's Networking Marketplace?

We Have Sections For:

Telecommunications Equipment,
Datacommunications Equipment,
Bids & Proposals, Computers,
Consulting Services,
Real Estate, Seminars,
Software, Training

Call Or Write: **Network World**

Joan Bayon Pinsky, 161 Worcester Road,
Box 9172, Framingham, MA 01701-9172;
800-622-1108 (In MA 508-875-6400)

Mountain & Pacific: Susan Egan, Suite 145,
18008 Sky Park Circle, Irvine, CA 92714;
(714) 250-3006

Plan Your 1990 Networking Marketplace Ad Schedule

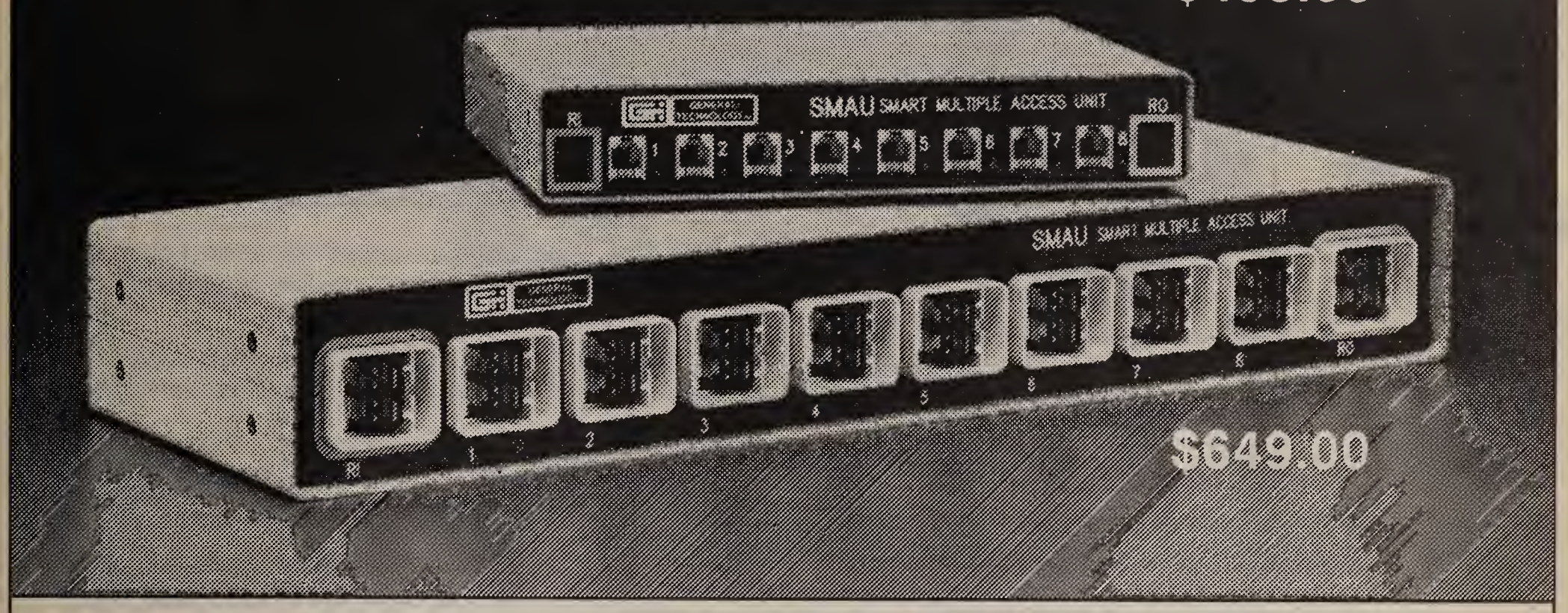
Call Joan Bayon Pinsky
1-800-622-1108 (in MA 1-508-875-6400)

Pacific and Mountain Time
Call Susan Egan 714-250-3006

A Smart Choice

For Your Token Ring Network

$495.00



ASmart MAU

Your Token Is Only As Good As Your Ring!

That's why General Technology developed a family of Microprocessor-based SMART MULTIPLE ACCESS UNITS (SMAU's) for both 4 and 16 Mbps for use with the IBM cabling system and unshielded twisted pair.

HI-TECH DESIGN

Hi-tech design provides the user with peace of mind while the active microprocessor monitors the Token Ring Network for proper network performance. When the intelligent algorithms of the SMAU detect network problems, the SMAU takes corrective action, restoring the ring to an optimally functional state automatically, without user intervention.

LED INDICATORS

LED indicators display characteristics of the failure as well as location reporting. (Not just the phantom-voltage-present indication other vendors provide with endless detail.) After the SMAU has reconfigured and restored your token ring network, these indications remain to direct the technician to the exact location of the failure. Once repairs are completed, the SMAU will automatically return the network to its original configuration and indicate normal status.

EXTENDED RANGE

Extended range to over 1000 feet is available on some models to accomodate those special requirements.

POWER FAIL DETECTION

Power fail detection insures an orderly shutdown of the affected portion of the network, leaving the configuration intact, as opposed to most other active MAU's. The SMAU with extended range repeaters will disconnect the users on the affected SMAU and automatically bypass to restore the ring. When power is restored, the SMAU will reconfigure and restore the network automatically to its original configuration.

COMPANION PRODUCTS AND SERVICES

Companion products and services include Media Filters, Patching Products, Rack and Wall Mounts, and Technical Assistance.

FULL COMPATIBILITY

Full Compatibility with 802.5 and IBM* Token Ring Standards.

PRICE

A real smart buy! Why buy a dumb MAU when you can buy a smart MAU for about the same price?

*Registered trademark

GENERAL TECHNOLOGY INC.

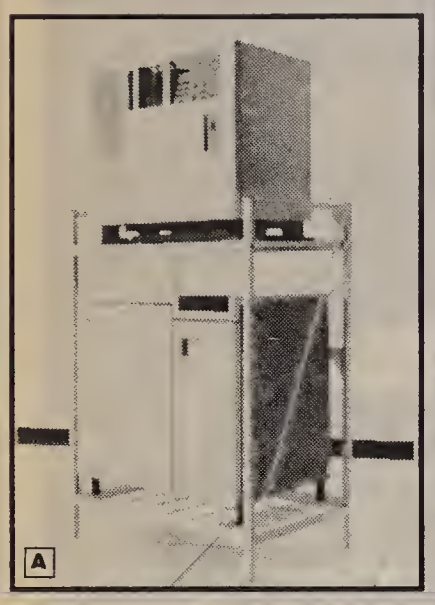
See the FAXNeT Form on Page #108

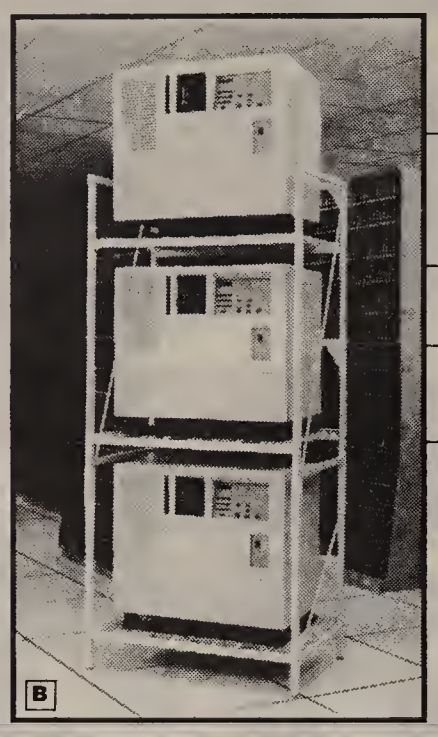
415 Pineda Court • Melbourne, Florida 32940 • (407) 242-2733 • (800) 274-2733 • FAX 407-254-1407

STORAGE EQUIPMENT

DATA CONNECTIONS™

3174/3274 CONTROLLER STACKING FRAME WITH ADJUSTABLE SHELVES





A CSF-174
$385.00 EACH

B CSF-174 3 Hi
$549.00 EACH

Note: 3 Hi Base for Existing CSF-174 $164.00 each

In Stock — Ships UPS — Additional Shelves and other options are available

VISA/MASTERCARD accepted

DATA CONNECTIONS, INC.
Suppliers of Data Communication Equipment

Deep River Corporate Center
7858 Thorndike Road
Greensboro, North Carolina
27409

Attn: End Users

Upgrading Your Equipment?

Sell your present system through an ad in Network World.

Write Or Phone: Network World, Classified Advertising

Joan Bayon Pinsky, 161 Worcester Road, PO Box 9172, Framingham, MA 01701-9172; 1-800-622-1108 (in MA 508-875-6400)

Pacific & Mountain: Susan Egan, 18008 Sky Park Circle, Suite 145, Irvine, CA 92714; 714-250-3006

Buy, Sell Or Announce Through Network World's Classified Section

Buying or selling communications-related products or services?

Or do you want to announce an upcoming event or business opportunity?

If so, Network World's classified section is the right choice for you.

You'll reach more than 70,000 communications/networking professionals all of whom are buying decision makers.

And you'll reach them every week.

Find out just how effective and cost efficient Network World classified advertising can be.

For all the facts write or call:
Network World, Classified Advertising

Joan Bayon Pinsky, 161 Worcester Road, PO Box 9172, Framingham, MA 01701-9172; 800-622-1108 (in Mass., 508-875-6400)

Pacific & Mountain: Susan Egan, 18008 Sky Park Circle, Suite 145, Irvine, CA 92714; 714-250-3006

NETWORKING CAREERS

Technical

Your Career Can Go As Far As Your Ideas

Do you want to be a contributing part of shaping the future in our telecommunications industry? Do you seek challenge, innovation, high energy, exciting work environment and a group of professionals dedicated to excellence? Are you committed to hard work, promotability and the understanding that the biggest is not always the best? US SPRINT, the total digital fiber optic network offers this and much more.

Network Analysts

These opportunities are both technical as well as marketing support oriented. And the responsibilities include:

- Traffic analysis of Fortune 1000 corporate networks
- Optimized voice/data network designs for dynamic corporate networks
- Design specifications for software network design models
- Innovative solutions to corporate network design issues
- Customer network design presentations

Our requirements/job qualifications range from entry level (4 year degree with emphasis on analytical abilities) to a 4 year degree plus 5 years experience in voice/data integrated telephony networking. We will accept degrees in math, operations research, management science, industrial engineering, computer science or business administration.

These positions located in Atlanta, GA. For consideration, please send resume along with salary history/ requirements and daytime phone number to: **Reg Brown, 3100 Cumberland Circle, Atlanta, GA, 30339.** No phone calls please. An equal opportunity employer.

US Sprint®
WORK WITH THE BEST.

Network World
First Quarter 1990
Editorial Features

Feb 5 - Network World Salary Survey
- Bonus Distribution: Communication Networks

Feb 12 - 4M & 16M Token Ring Performance
- Bonus Distribution: NetWorld Boston

Feb 19 - Telecom Services Buyer's Guide: 900 Series

Feb 26 - Trends and Technologies Reshaping Networks: Higher Bandwidth Needs

Mar 5 - Telecom Buyer's Guide: T-1 and T-3 Multiplexers

Mar 12 - Datacomm Buyer's Guide: Network Design Software - Harvey Study Issue

Mar 19 - Telecom Services Buyer's Guide: BOC Centrex Offerings

Mar 26 - Bridging 4M & 16M Token LANs

ANNOUNCING

Network World's

Direct Response

Card Deck

Dates for 1990

Network World Direct Response Card Decks can be your trump card for generating quality leads and boosting your sales. When you advertise in our decks, you deliver your message to over 70,000 *Network World* subscribers, and at just pennies per contact.

It's simple, your advertising message one side and your company name and address on the other. We make it easy for our readers — your customers — to respond to your message.

DATES	Issue Date	Reservation Close
	January, 1990	December 15, 1989
	March, 1990	February 23, 1990
	May, 1990	April 13, 1990
	July, 1990	June 15, 1990
	September, 1990	August 10, 1990
	November, 1990	October 12, 1990

Reserve your space today by calling:

Joan Bayon Pinsky
Sales Director/
Product Classified Advertising
1-800-343-6474
(or in MA 508-820-2543)

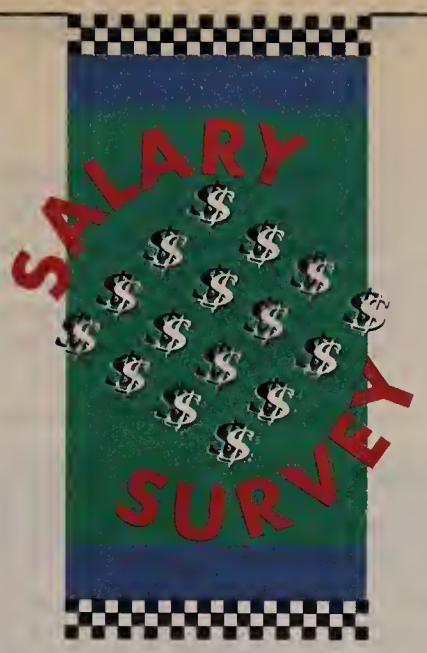
OR

Susan Egan
Account Executive
714-250-3006

(Mountain and Pacific time zone advertisers).

Your marketing success is in the cards — *Network World's* Direct Response Cards.

NETWORK WORLD



Keeping the lead

CONTINUED FROM PAGE 1
data networks, 57% are responsible for data networks, while 7% are responsible for voice-only networks.

Total compensation varies by more than $10,000 between different regional Bell holding companies. Respondents in the Nynex Corp. region, with an average compensation of $59,346, are paid the most.

The Pacific Telesis Group region is next at $56,108, followed by Bell Atlantic Corp. ($54,925), Bell South Corp. ($54,132), Ameritech ($54,078) and South-Western Bell Corp. ($52,430). Respondents working in the U.S. West, Inc. region receive the lowest average compensation ($48,591).

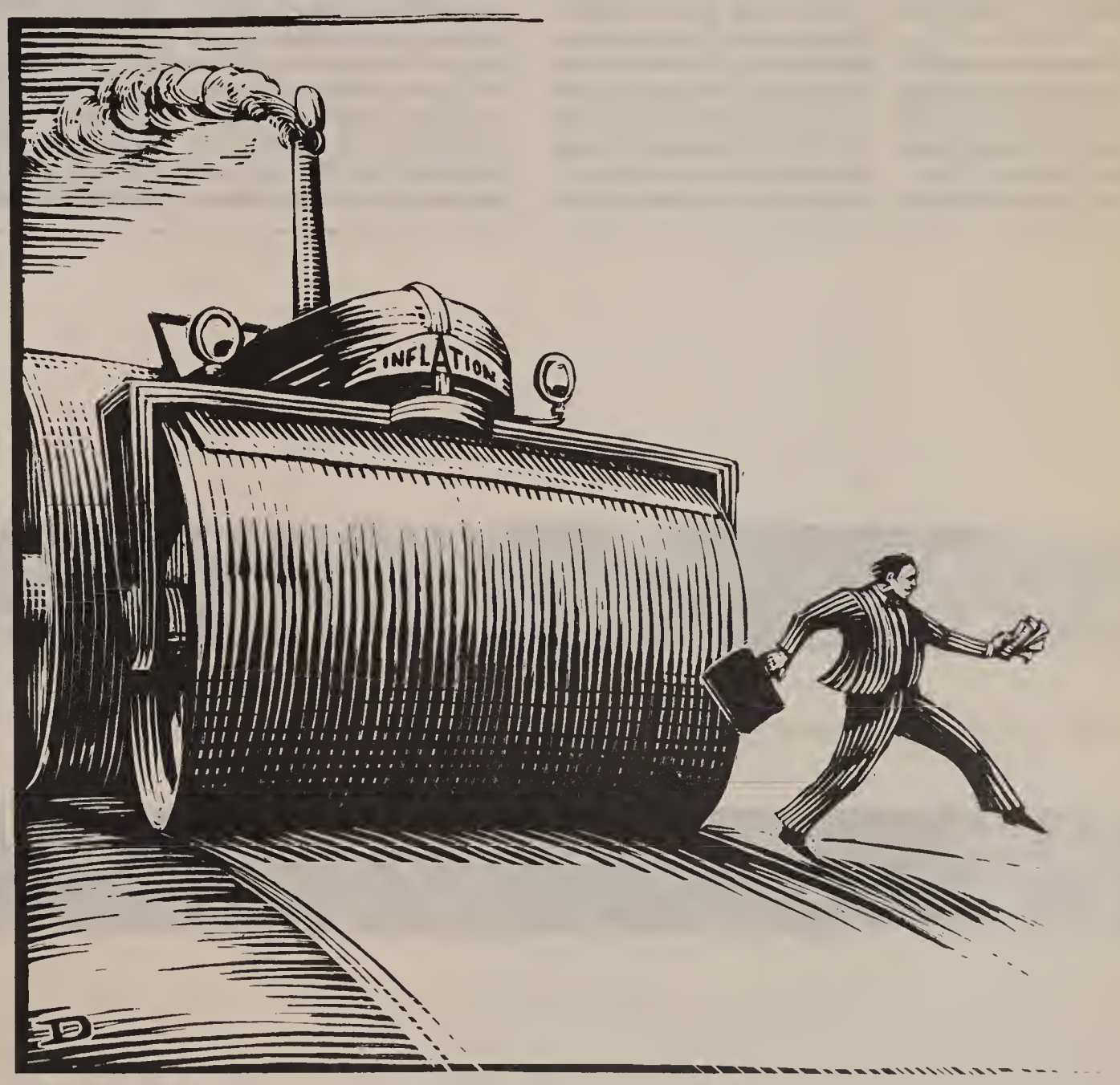
Salaries also vary widely between industries. The highest average compensation goes to managers working for companies whose primary business is computer or communications equipment manufacturing, value-added reselling or value-added dealing, and carrier or interconnect service provision. Respondents working for companies whose primary business is health care services, education or government have the lowest levels of compensation.

The range of compensation from industry to industry is almost $20,000, from $65,803 for those working for computer and communications equipment manufacturers to $45,952 for those working in the health care services industry.

While total compensation increased by an average of nearly 7% from 1988 to 1989, the study found large variations by industry. Respondents working for system houses, and value-added dealers and resellers got the high-

(continued on page 100)

Salamone is the features writer for Network World.



According to our salary survey,
most network managers stayed a step ahead
of the inflation steamroller last year.

ILLUSTRATION ©1990 BOB DAHM

(continued from page 99)
est increase (10.9%), followed by those people working for banks, insurance companies, financial institutions and real estate firms, where the average increase was 8.9%.

The industries reporting the lowest increases were computer and communications equipment manufacturers (1.2%) and carriers and interconnect service providers (2.9%).

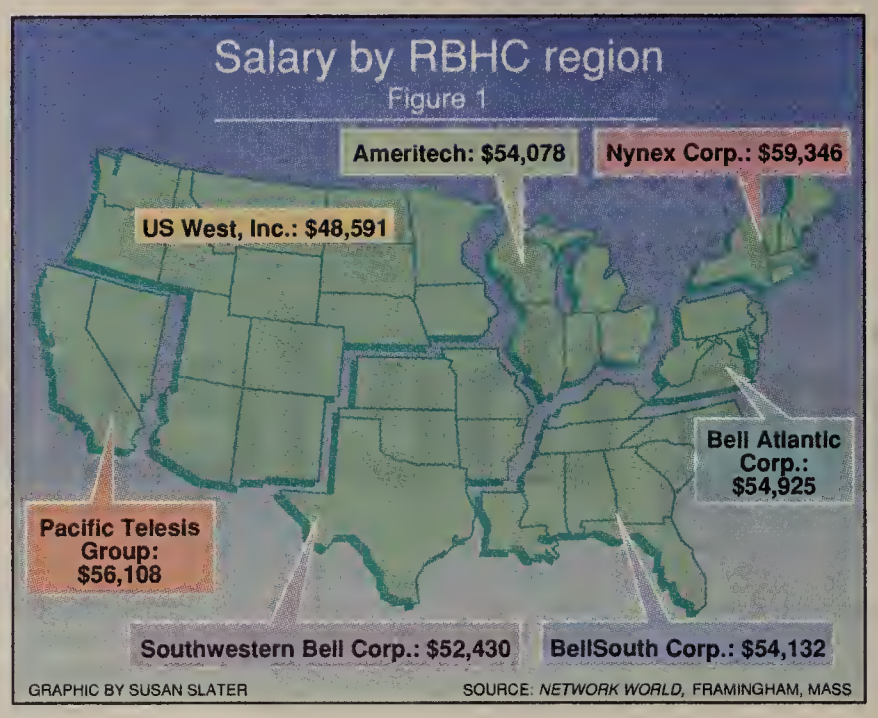
Is the compensation fair?

In the spirit of 19th century writer Thomas Carlyle, who said "A fair day's wages for a fair day's work," this survey asked *Network World* readers if they thought they are getting paid what they are worth. For the most part, the answer was yes.

Seventy percent of the readers surveyed say they think their total compensation is in line with that of other managers at their level in their own company. Fourteen percent of the people surveyed think they earn more than other managers in their company.

Among those who do not think their compensation is in line with that of other managers, 86% say they believe their compensation is lower by an average of 18%.

The overall level of satisfaction with salary drops slightly when readers are asked how they think their compensation compares with that of their industry peers. Fifty-one percent say they think it is about the same, 12% say it is better, and 37% indicate it is worse.



If the grass is truly greener at other companies, as one might infer from the 37% average of the respondents who claim they earn less than their peers, people should be changing jobs to get what they perceive as higher paying positions at other companies.

Is this the case? In general, no. More than two-thirds of the survey respondents have been with their current employer at least five years. On average, respondents have been with the same employer for 9.2 years.

Regional differences in the perception of what constitutes fair wages exist. Since respondents in the Nynex region have the highest average compensation, it is not surprising that nearly two-thirds of the Nynex respondents (66.2%) say their compensation is better than or about the same as that of their peers at other companies.

Bell Atlantic region respondents have essentially the same level of satisfaction (66.1%), while the Pacific Telesis (63.6%) and Ameritech (62.6%) regions are close behind. The lowest levels of satisfaction came from U.S. West (59.1%), Bell South (58.5%), and SouthWestern Bell (58.2%) respondents.

The survey finds a large variation in salary satisfaction from industry to industry.

The highest level of satisfaction comes from respondents working for retail and wholesale traders, carrier and interconnect service providers, manufacturers of computer and communications equipment, as well as value-added resellers, value-added dealers and systems houses. Those working for companies whose primary business is health care services, the government or the military indicate the lowest levels of satisfaction.

The level of satisfaction seems primarily tied to the level of compensation. The one exception is in the field of education, where the average compensation is on the low side ($49,139) compared with other fields, yet the level of satisfaction is about average. In education, 61.6% indicate their compensation is the same or better than their peers at other institutions.

While nearly two-thirds of those in education say they believe their compensation is about the same as or better than their peers in education, they still don't think it is enough.

Of those working at educational institutions, 52% — the highest number found in the survey among the different types of employers — earn outside income. Besides those working in educational institutions, 48.3% of the respondents working for health

Survey methodology

The survey results are based on 775 responses from a randomly selected sample of 2,000 *Network World* subscribers, yielding a 39% response rate.

Each member of the sample group was sent a four-page questionnaire. The survey results were compiled and analyzed by IDG Communications Research Services in Framingham, Mass.

care service companies also earn supplemental income.

Overall, 30% of the respondents in the survey indicate they earn supplemental income. Consulting (58%) and teaching (21%) are the most frequently cited ways of earning outside income.

One factor that may relate these methods of earning outside income to the higher than average number of respondents in education and health care earning outside income is that people in these two fields are more likely to hold a doctoral degree than those in any other field. Less than 5% of the survey respondents have Ph.D.s, while 19.5% of those in education and 13.8% of those in health care services have doctoral degrees.

Only 10% of the respondents working for carriers and interconnection service providers report earning outside income. Respondents whose company's primary business is retail or wholesale trade also reported earning outside income at the fairly low level of 18%.

Regional differences in moonlighting showed up in the study. For example, respondents reporting the lowest levels of earning outside income are in the areas covered by SouthWestern Bell (23.3%) and Nynex (25%). Those areas with the most respondents earning outside income are Bell Atlantic (29.9%), U.S. West (30.6%) and Pacific Telesis (31.1%).

Thirty-nine percent of MIS/data processing staff and 38% of MIS/DP managers — the highest percentage of any group in the survey — report that they earn outside income. The survey finds that managers and staff in data communications, telecommunications and engineering or technical positions earn outside compensation at a lower rate than the average of 30%.

Salary by job title

Figure 2

Owner, partner, president, CEO, V.P.	$78,852
Telecommunications: V.P., director, manager	$61,102
Engineering/technical: V.P., director, manager	$59,888
Other corporate manager	$59,143
Data communications: V.P., director, manager	$57,237
Consultant	$54,322
Networking communications: V.P., director, manager	$53,473
MIS/DP: V.P., director, manager	$52,359
Engineering/technical: Staff	$47,352
Data communications: Staff	$45,878
Networking/communications: Staff	$45,250
MIS/DP: Staff	$42,007
Telecommunications: Staff	$40,373

GRAPHIC BY SUSAN SLATER SOURCE: *NETWORK WORLD*, FRAMINGHAM, MASS.

Wage gaps

The difference in pay between managers and staff generally amounts to about $8,000 to $20,000. For those respondents indicating their job description as networking or communications, managers earn an average of $53,473 and staff earn $45,250.

The wage gap grows slightly for those working in MIS/DP departments, where managers earn an average of $52,359, while staff members earn $42,007 on average.

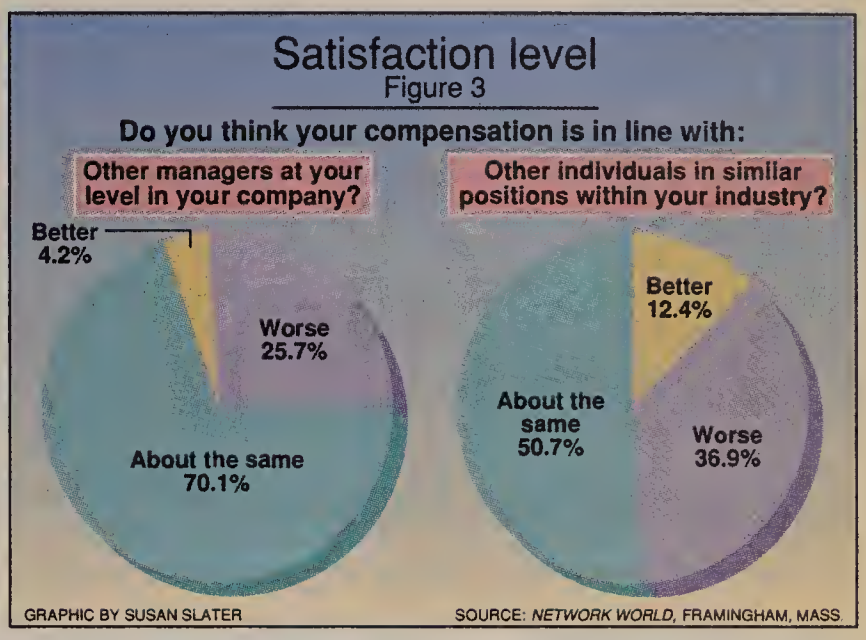
Managers responsible for data communications have an average total compensation of $57,237, while data communications staff members average $45,878. For respondents whose job function is considered engineering or technical in nature, the average compensation is $59,888 for managers and $47,352 for staff.

The two jobs that have the largest differences in pay between upper-level and staff positions are also the highest paying jobs. Networking professionals who serve as corporate managers are found to have the highest average incomes in the survey.

Satisfaction level

Figure 3

Do you think your compensation is in line with:



GRAPHIC BY SUSAN SLATER SOURCE: *NETWORK WORLD*, FRAMINGHAM, MASS.

Those listing their titles as owner, partner, chief executive officer, president or vice-president earned an average of $78,852 in 1989. Other corporate managers received $59,143. Managers responsible for telecommunications, the second highest group in average total compensation, earned about $20,000 more than their staff members: telecommunications managers were paid $61,102, while the staff average is $40,373.

Looking ahead, the survey's respondents say they believe their compensation will increase by almost 7% in 1990. Government economists predict an inflation rate of between 4% and 5% for the year. If both are correct, networking professionals should find themselves winning in the race with the inevitable inflation steamroller.

Dedicated access line-based WATS services (continued from page 84)

Company	Product	Target market (hours/dollars per month)	Origination method	Installation charges (10)*	Monthly charges (10)	Minimum call duration/Minimum monthly bill requirement	Accounting codes	Validated security codes (1)	Travel cards	Speed dial	Call detail on magnetic tape
Metromedia-ITT Long Distance Secaucus, N.J. (201) 333-5300	Custom WATS 400	250-1,400/ $2,600- $15,000	DAL, T-1	Service, $50; per line, $0; CO, $0; access coordination, $0	Service, $50 per access line group; per line, telco + $10; CO: DAL, $10; T-1, $60; access coordination, $0; port charges, $0	6 sec/$0	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $200; MRC, $25	No	Yes, MRC, $0; NRC, $0	Yes, NRC, $50; MRC, $0	Yes, NRC, $500; MRC, $100 per tape
	Precision Fit (limited availability: Fla., Texas, N.J., N.Y.)	900-3,500/ $8,000- $30,000	DAL, T-1	Service, $250; per line, $0; CO, $0; access coordination, $0	Service, $0; per line, varies by state (5); CO, $0; access coordination, $0; port charges, $0	30 sec/varies by state (4)	Yes, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $5	Yes, post-dialed,3-4 digits; NRC, $0; MRC, 3 digits, $10 and 4 digits, $15	Yes, MRC, $0; NRC, $0	No	Yes, NRC, $250; MRC, $100 per tape
Telecom*USA Atlanta (800) 868-2600	Corporate WATS	150-15,000/ $1,000- $100,000	T-1, DAL	Account, $500; per line, DAL, T-1, telco; access coordination: DAL, telco; T-1, telco	Service, $0; per line: DAL, $130; T-1, telco; CO, telco; access coordination, $0; port charges, $0	6 sec/$1,000 per invoice, $200 per circuit	Yes, validated, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $10+	Yes, post-dialed, 2-4 digits; NRC, $0; MRC, $10+	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $0; MRC, $100
	Corporate LATA	250-40,000/ $2,000- $250,000	T-1	Service, $0; per line: T-1, telco; CO: T-1, telco; access coordination, $0	Service, $50 per account; per line, telco; CO, telco; access coordination, $0; port charges, $0	6 sec/$2,000 per account, $200 per circuit	Yes,validated, nonvalidated, post-dialed, 2-4 digits; NRC, $0; MRC, $10+	Yes, post-dialed, 2-4 digits; NRC, $0; MRC, $10+	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $0; MRC, $100

This chart includes a representative selection of vendors in the dedicated access line-based WATS services market. Most vendors offer other dedicated access line-based WATS services, and some vendors not included offer a full range of competitive products.

TELECHOICE, INC., MANCHESTER, CONN.

(continued from page 80)

rier. For instance, remember AT&T's Pro America I, II and III? Now it is AT&T's Pro WATS. Breaks in discount plan schedules will create the market segmentation that separates services previously provided.

Users who know they are using the appropriate service within a carrier's product line are not worried about whether or not they are getting the best deal with that long-distance carrier. This reduces the likelihood that managers will open their network to reevaluation and, therefore, reduces the chances that a user will change carriers.

For the user, this migration path is a blessing. There are fewer services to evaluate; the decision of which long-distance provider to choose is based more on the carriers and less on the services.

Price is not the great buying factor that it used to be. This is not to say that price is not important, but the 30% to 40% discounts available in the early days of competition no longer exist. Pricing differentials with MTS and WATS services today are typically in the 3% to 10% range.

This buying environment places more emphasis on other nonservice criteria, such as billing, network reliability and customer service. Indeed, options such as enhanced billing, alternate routing, fiber-only routing and added feature capabilities are being offered to boost the attractiveness of WATS services.

Most carriers offer the basic menu of WATS features — validated and nonvalidated accounting codes, speed dial, travel cards and magnetic tape billing. The big differentiating factor has been in

Dedicated access line-based WATS services (continued)

Company	Product	Target market (hours/dollars per month)	Origination method	Installation charges (10)*	Monthly charges (10)	Minimum call duration/Minimum monthly bill requirement	Accounting codes	Validated security codes (1)	Travel cards	Speed dial	Call detail on magnetic tape
US Sprint Communications Co. Kansas City, Mo. (800) 347-3300	UltraWATS	550+/ $5,500+	DAL, T-1, T-3	Service, $0; per line: DAL and T-1, $0; T-3, ICB; CO, $0; access coordination: DAL, $500; T-1, $1,165; T-3, ICB	Service, $50 per location; per line: DAL and T-1, telco; T-3, ICB; CO, $0; access coordination, $0; port charges, $5 per active circuit	6 sec/$0	Yes, nonvalidated, postdialed, 1-5 digits; NRC, $0; MRC, $15	Yes, validated, postdialed, 1-5 digits; NRC, $20; MRC, varies (7)	Yes, NRC, $0; MRC, $0	No	Yes, NRC, $50; MRC, $100

DAL = Dedicated access line
ICB = Individual case basis
MRC = Monthly recurring charge
NA = Information not available
NRC = Nonrecurring charge

All listed carriers offer termination coverage in 50 states, Puerto Rico, U.S. Virgin Islands and international areas.
Carrier billing increment is 6 seconds unless otherwise noted.

*Footnotes:

1. Validated security codes are validated codes which, unless inputted correctly, will not allow completion of dialed call, regardless of access. Equivalent to validated account codes.
2. Allnet offers 4-digit nonvalidated, as well as 2- and 3-digit validated codes. Pricing varies by number of digits and number of codes.
3. Allnet offers 2- and 3-digit validated authorization codes for special access customers.
4. Requirement varies by state: Fla., $10,000; Texas, $8,000.
5. Prices vary depending on state: DAL, N.Y., telco; N.J., $125; Fla., telco w/$400 credit per line; Texas, $125.
6. Up to 8 speed dial numbers, one speed dial package will be provided free of charge with every $300 in usage.
7. US Sprint uses a scale to determine the charges for validated account codes: 1-5 codes is $7 a month, up to 301-1,000 codes for $200 per month.
8. AT&T has a local line installation charge for its dedicated service (charge is variable depending on length and type of line).
9. There are other WAL- and DAL-based services that are based on banded pricing plans, which are not being actively sold by the carriers and for that reason are not included in this survey.
10. "Telco" refers to charges by the telco and are either billed by the telco or the interexchange carrier. In either case, the customer incurs no extra fees from the interexchange carrier for this item.
11. Option 1: $20 (N.J.), $25 (elsewhere). Option 2: $45 (N.J.), $50 (elsewhere).

This chart includes a representative selection of vendors in the dedicated access line-based WATS services market. Most vendors offer other dedicated access line-based WATS services, and some vendors not included offer a full range of competitive products.

TELECHOICE, INC., MANCHESTER, CONN.

customized billing. As telecommunications grows as a strategic resource within companies, cost control and management increases in importance. Increasingly, carriers are offering companies customized billing as part of the initial sales pitch.

Because decisions about WATS services have become more service-based than price-based, some carriers are also considering offering 700 services to increase customer loyalty for their MTS and WATS services. A 700 service is a value-added service capable of providing information and entertainment services exclusively to a carrier's presubscribed customers. Calls on the 700 service are routed similarly to 800 and 900 service calls.

When the local telephone company sees a 700 prefix on a call, it forwards that call to the presubscribed carrier for that customer. Thus, if customers subscribe to MCI Communications Corp. Prism Plus, then their telephone lines would have access to all of MCI's value-added services. These could include weather, traffic information, horoscopes, sports lines and tax advice. As the carrier adds more 700 services, the WATS service increases in value to the customer — even though the WATS service does not change.

The market is heading toward more integrated long-distance plans in which a manager chooses a long-distance carrier and the selection of service is nearly automatic. Choices of access will depend more on the enhanced features and further economies the company wants to accrue.

At some point, the distinctions

(continued on page 104)

WATS new?

continued from page 103

between virtual network services and WATS services will also blur. In fact, like MTS, WATS could very well find itself pushed out of the market as virtual network services become targeted toward the lower end of the market. Long-distance carriers are now proposing virtual network solutions to users with bills as low as $3,000 per month.

Consider some of the following vertical market-oriented products that will address specific niche needs:

■ **Yuppie WATS.** Standard WATS pricing with additional discounts for travel card usage and accounting codes. Professionals in the 21- to 30-year-old age group are often unmarried and travel frequently for work. While corporations often pick up the tab for calling card traffic, they may not for personal calls. Many young professionals are starting their own businesses and need additional calling card discounts and feature flexibility.

■ **Family WATS.** A multilocation WATS package that centralizes billing into the main family account and covers Grandma's house, the kids in college and any other members for which the family may be providing. A personal 800 number with applicable cross-service discount schemes could be tied into this account for traveling away from home.

■ **Commuter package.** A service that marries WATS service with cellular service. Ideal for people who travel long distances to work every day. Special pricing plans could link cellular usage and long-distance usage where applicable and provide the customer with enhanced services designed for specialized commuter problems ("Not just a yuppie toy," *NW*, Jan. 15.).

■ **Point-to-point WATS.** A WATS service that rewards two sites that subscribe to the same carrier by giving them discounts for calling between the two points. This service would be great for small companies with just two sites.

Some of the carriers are already offering portions of the above services, and complete packages that integrate service, features and billing are on the way.

In addition, some of the above descriptions fit nicely into a virtual network definition. For instance, the point-to-point WATS service and family WATS are simply long-distance services with on-net and off-net locations. These residential virtual network services are definitely on the way.

In the end, pricing will be less of a major factor, and the enhancements that come with the product will take on more importance in users' buying decisions.

Communications in the boonies

continued from page 65

lower error rates than the company's old AT&T analog microwave connection.

A T-1 line is currently being used for voice connections only. It feeds into the US West Centron PBX that connects the Fargo and Gwinner branches with the company's Bismarck, N.D., data processing center 100 miles away. The T-1 line uses a DMS-100 in Fargo and a remote node in Gwinner.

Where there were once five or six tie lines connecting Fargo to Bismarck, the T-1 capacity allows 24. Three 800-number voice mail lines serve field sales and support.

US Sprint has completed a cross-local access and transport area fiber connection to Bismarck so that by the second quarter of 1990, Steve Krahler, Melroe's data processing manager, will be able to upgrade the lines that connect his network of Honeywell, Inc. minicomputers and mainframes from 9.6K bit/sec to 19.2K bit/sec.

In fact, Krahler has only held off upgrading to 56K bit/sec because his existing equipment can't handle such high-speed data rates. Instead of swapping in boards, he is going to wait until the equipment gets completely replaced.

Krahler was impressed that US West strung the fiber out to Gwinner. "They probably picked up six little towns along the way," he says. "It was really to take care of us" — a move in keeping with the RBHC's strategy of moving beyond high-density urban centers.

For example, Project Avalanche, a $115 million, three-year project, replaced 158 electromechanical central office switches with DMS-10 and DMS-100 switches in Washington, Oregon and Idaho by January 1989.

When US West was trying to sell a PBX to Melroe's manager of voice communications, the RBHC offered to sweeten the deal with the construction of the fiber link, an offer too good to refuse.

Troup of Thelen, Marrin, Johnson and Bridges says he thinks US West may also have been trying to keep North Dakota's most successful manufacturer from defecting to the maverick networks similar to that of INS, which are currently springing up in the region.

If they are lucky, companies setting up shop in rural areas may be blessed with an independent telephone company offering the most up-to-date digital services far in advance of what is available in big cities. Yet these corporations may also have to come up with innovative ways of piecing together the networks they need to conduct business.

But as long as telecommunications services and service quality approximate or exceed that available in cities — and since it's unrealistic to expect real estate, personnel and other business expenses to come down — it's easy to predict that more companies in major metropolitan areas will decide to pull up stakes and head to a place where the grass is greener.

Fax pacts

continued from page 77

The same principle applies to fax. Senders can number paragraphs, number pages (such as one of five or two of five, and so on), identify the parties on each page and place a conspicuous notation on any partially blank pages. They can inspect delivery confirmation reports issued by the fax machine to spot errors. They can also call to confirm complete receipt.

The recipient can read the printout to see if it makes sense and ask for a repeat transmission if necessary.

Notarizing

The recipient can further enhance reliability by signing the fax, having it notarized and faxing it back. The originator can then compare the return fax against the original.

It is usually preferable for contracts to be signed by both parties.

The final objection to fax is that most machines print on thermal paper, which archives poorly. Thermal paper yellows and disintegrates over time. One solution could be to photocopy fax printouts. The sender might state in the document that the fax printout and any complete photocopy of the same are counterpart original documents.

The alternative is to switch to plain-paper fax machines. Although they are more expensive than thermal machines, the greater efficiency may justify the extra cost.

The particular ways in which contracts are signed and delivered are dictated more by custom than by the strictures of law. It takes time for customs to change because no one likes to be a leader on these matters. Still, it seems that the customs we now use can safely evolve to make more efficient use of fax.

Racal-Milgo touts bridge/router

continued from page 5

56001 chip on each wide-area interface to process up to 30 million instructions per second (MIPS). By contrast, most bridges and routers employ a single Motorola 68000 microprocessor, which can process only one MIPS.

The AMD 29000 enables the LanNet Express bus to transfer data between cards at 230M bit/sec while maintaining packet filtering and packet forwarding rates of 75,000 packet/sec and 30,000 packet/sec, regardless of the packet size, the company said. Those filtering and forwarding rates are representative of a fully loaded box with three interfaces.

Routing protocol

A proprietary protocol that is downloaded from the floppy disk drive to the wide-area interface provides LanNet Express' routing functionality, according to Mark McWilliams, senior marketing manager. The protocol, ExpressLink, supports multiple redundant paths between LANs supported by ExpressNet nodes.

This protocol gives users the option of configuring networks in a mesh topology and routing from a single site to multiple remote sites, as well as balancing the traffic load over multiple paths.

But more important than performance and configuration capabilities will be filtering and statistics-gathering features that offer powerful tools for configuring WANs, according to Timothy Zerbiec, a principal with Vertical Systems Group, a Dedham, Mass.-based consultancy. Statistics-gathering capabilities will generate the necessary data for users to evaluate traffic patterns and make better network design decisions. Those statistics give performance data for LanNet Express nodes, networks connected to them or individual devices on those LANs.

LanNet Express is available 90 days after receipt of order.

The bridge/router is priced at $5,890, while a low-end configuration with one interface costs $13,995. A high-end configuration with three interfaces is priced at $25,000.

Letters

continued from page 61

Vindicating Murphy's Law

Regarding the column "Murphy is alive and well at some companies" (*NW,* Dec. 25/Jan. 1) by Ralph Brandt: Mr. Brandt clearly has an ax to grind that is totally unrelated to Murphy's Law.

First, he suggests that "Murphy's Law is a crutch used by incompetents to excuse their failures."

The use of the word "incompetent" really bothers me. He may have meant it to mean mediocrity, but to suggest that those making errors are incompetent is incongruous with the facts.

Next, he states, "Things go wrong only if you fail to take action to prevent them. I have never seen a planned fiasco." Again, the choice of the word "fiasco" is an overreaction.

There are many mistakes and errors that are irritating without reducing a product development scenario to the level of fiasco.

Many fine software products have gone to the grave never having been fully debugged.

Suppose it takes an hour to validate a line of code, 1% of all the lines of code have mistakes and it would take an average of 10 hours to debug one mistake.

It would be a valid management decision to choose the approach that included less review. Mistakes are and should be a planned cost in the development cycle.

In suggesting that technical professionals are overpaid day laborers, Mr. Brandt has totally lost his perspective of the greater marketplace.

You would be hard-pressed to find a group of professionals who are paid less per hour, per year of education or per year of work experience.

In summary, Murphy's Law is a nonissue. The vast majority of technical people are competent, not incompetent. They generate useful products, not fiascos. And with few exceptions, they are not being overpaid.

Joshua Segal
Nashua, N.H.

PBX facts

We've received several inquiries regarding the chart on private branch exchange ratings published in the Dec. 4 issue of *Network World,* which was based on data from our COMM/SURV program.

The rating data was accurate but is in need of some clarification.

The data presented in our report was not rank-ordered by manufacturer since we didn't believe there to be a statistically significant difference among many of the ratings.

We believe many of the ratings are marginally different and do not warrant the emphasis on rank order.

The data is aggregated by vendor and should not be interpreted to represent any specific model in a vendor's product line.

The ratings are provided by users that currently use the switches; they do not reflect the perceptions of users concerning other equipment.

Barry Gilbert
Principal
COMM/SURV Division
TFS, Inc.
Westford, Mass.

AT&T asks FCC to OK plan

continued from page 4

customers. A new Usage Reduction Plan would give customers a 5% discount before any other discounts on all SDN and 800 charges above $10,000 in each billing month. In addition, customers would get discounts on their combined SDN/800 usage based on their monthly charges and term of commitment.

For a one-year commitment, customers would get a 5% discount on domestic service and a 4% discount on international service for monthly charges between $20,000 and $30,000. The discounts increase to 12% on domestic service and 10% on international service for monthly charges between $30,000 and $300,000. Above $300,000, domestic and international services would be discounted by 12%.

For a two-year commitment, customers receive a 5% discount on domestic service and a 4.5% discount on international service for monthly charges between $20,000 and $30,000. For charges between $30,000 and $300,000, discounts increase to 12% for domestic service and 11.5% for international service.

For monthly charges above $300,000, domestic discounts would be 15% and international discounts would be 14%.

For a three-year commitment, customers would receive a 20% discount on domestic service for any monthly charges over $20,000. International discounts would be 5% for charges between $20,000 and $30,000, 13% for charges between $30,000 and $300,000, and 16% for charges over $300,000.

AT&T estimates that competitors' prices for virtual network services comparable to SDN are 7% to 10% lower than its pricing, while rival 800 services are 6% to 8% lower.

In an affidavit submitted with the discount proposal, Frank Iannas, AT&T's director of outbound services, discussed a number of instances in which AT&T says it lost business to rivals primarily because of competitors' more attractive pricing plans.

In late 1989, Iannas said AT&T lost $18 million in business when Greyhound Lines, Inc. switched from AT&T's outbound services to lower priced outbound and 800 services from US Sprint Communications Co. Also in 1989, Zenith Electronics Corp. switched from AT&T's outbound and 800 services to a lower priced US Sprint offering.

In the same year, Iannas said AT&T lost $1.3 million in outbound and 800 business from Betz Laboratories to US Sprint. In 1988 and 1989, AT&T claimed it lost $1.6 million in SDN and 800 business from Great Atlantic & Pacific Tea Co., Inc. to US Sprint because that carrier offered more attractive discounts.

Iannas estimated that AT&T will probably lose an additional $32 million this year if the plan is not approved.

See the FAXNeT Form on Page #108

Application tool pays off

continued from page 1

formance of its products against those of competitors and quickly detect changing market conditions to determine whether to shift investment strategies for a higher rate of return.

Putnam also plans to use the Financial Workbench to build a modeling application that will enable portfolio managers to test how a mutual fund would perform if certain stocks and bonds were substituted for others.

This application will parcel out computationally intensive tasks to the network processor best equipped to handle them.

"In this business, you want to be able to whip up quick models and test your theories," said Edmund Zaharewicz, systems architect for Putnam, which sells a broad mix of mutual funds and invests pension fund assets for corporate clients.

Written in the C++ language, Financial Workbench is a library of core software routines that are stored as objects on a Sun Microsystems, Inc. SPARCstation 1 workstation.

When building an application, programmers use these objects rather than having to write long strings of code to perform operations. When the program executes, the object initiates a series of functions, such as locating and retrieving data from a remote data base.

Programmers can reuse objects in a variety of applications. This cuts development time drastically because the predefined routines can account for up to 75% of the code needed for any application, Levy said.

Putnam used this approach when developing its Fund Performance System, the first application generated with the aid of Financial Workbench. The application runs on a Unix-based server and enables financial analysts using microcomputers on an Ethernet backbone supporting the Transmission Control Protocol/Internet Protocol to pull data from other machines on the net as easily as if they were accessing a file on their workstation.

The Fund Performance System consists of client and server components.

The client component is an X/Windows-based user interface running under DOS, while the server component runs on a SPARCstation 1.

To use the Fund Performance System, portfolio managers select the specific mutual funds, stocks or bonds they wish to track from menus on the microcomputer screen. The request is passed over the LAN to the Fund Performance System running on the server.

> "In this business, you want to be able to whip up quick models and test your theories."
>
> ▲▲▲

The Fund Performance System relies on NCS' Location Broker to find data and then uses NCS remote procedure calls to pull data off the other machines.

The server software assembles the data into a single file and ships it to the microcomputer, where it is displayed in a window.

Armed with this information, portfolio managers can determine whether a Putnam mutual fund should be modified to match a higher rate of return offered by a competing mutual fund.

If the decision is made to boost the return on investment, the portfolio manager can use the microcomputer to retrieve data on the historical performance of selected stocks and bonds.

That data, coupled with information gathered from other non-network sources, will help the manager determine which stocks and bonds to buy or sell.

Prior to the Fund Performance System, portfolio managers had to rely on printed reports produced by batch processing on Putnam's IBM mainframe. The reports were generated once every two weeks. Alternatively, some portfolio managers tracked mutual fund performance data on their own microcomputers.

Northern Tel lays PBX foundation

continued from page 1

voice/data ports and 16 data-only ports, or a maximum of 512 ports.

Data ports support asynchronous communications at speeds up to 19.2K bit/sec.

The basic SL-1 module, by comparison, houses up to 10 line cards, each supporting eight voice and eight data ports, for a total of 160 ports. The SL-1 uses a single main processor to support

Northern Tel chiefs Paul Stern and Roy Merrills at debut of Meridian 1.

all call-processing tasks.

The Meridian 1, however, uses a hierarchical processing scheme with one main processor and a Motorola Corp. 68010 microprocessor on each shelf, off-loading simple tasks such as ring cadence from the main unit.

This change, coupled with the fact that the Meridian 1 uses a byte-interleaving scheme to link modules as opposed to the SL-1's bit-interleaving method, reduces the load on the main processor and increases the switch's traffic-carrying capacity by 25%, according to Northern Telecom. The Meridian 1 supports 120 time slots for voice and data traffic, compared to the 30 the SL-1 supports.

Customers can grow Meridian 1 switches by stacking additional modules, in 512-port increments, on the base unit.

Although they are stackable, the modules cannot be geographically distributed. Customers can, however, support a site up to 70 miles away using an SL-1 remote peripheral equipment module linked to the main system using two T-1 lines.

The Meridian 1 supports all telephones currently used with the SL-1 and the SL-100. Northern Telecom recommends users run three or four pairs of twisted-pair wire to each jack and a single pair to the desktop telephone. Stations can be located up to 3,500 feet from the switch.

The software-programmable trunk cards, which are new with the Meridian 1, enable customers to configure a port as a central office trunk, direct-inward dialing trunk, recorded announcement trunk or paging trunk. Previous cards were dedicated to one function.

Upgrading an SL-1

Currently, there are about 39,000 SL-1 users. Those looking to upgrade to the Meridian 1 must replace the current switch's software with Generic X-11 Release 15 software and add a $6,000 network card to link the existing switch to the Meridian 1 modules populated with the new line and trunk cards. Current SL-1 and SL-100 line cards cannot be used in the Meridian 1.

All the components needed to upgrade an SL-1 to the Meridian 1 are available now. Software and hardware needed to upgrade the SL-100 will be available in the fourth quarter of this year. Integrated Services Digital Network Basic Rate Access interface cards will be sold in late 1991.

The company declined to provide an average cost per line for the Meridian 1 or divulge the cost of the individual module because the switch is sold predominantly through distributors.

The Meridian 1 supports all the applications that currently run on the SL-1, including Meridian Mail, Northern Telecom's voice processing system, automatic call distributor and Meridian LANStar, the vendor's twisted-pair-based Ethernet local-area network product. Each application requires a dedicated module.

"We can add Meridian 1 components to our old [SL-1] L and M models to increase the systems' capacity, which is a big plus," said James Candito, senior telecommunications manager for the Bank of Boston Corp. Candito is also vice-president of the 68-company Insight SL-100 users group.

Users that had ordered the SL-1 or SL-100 before Jan. 30 can obtain an upgrade to a comparable Meridian 1 configuration free of charge, according to Rick Faletti, vice-president and general manager of Meridian Communications Systems.

Faletti said the company will continue to make the SL-1 ST, RT, NT and XT models available through 1990, but he estimated that the predominance of orders and shipments after the second quarter would be for the Meridian 1.

The SL-100 will be available "with no limitation," according to Faletti, who decined to say how long the company plans to continue manufacturing the switch.

Northern Telecom said it will sell the Meridian 1 worldwide, unlike rival IBM/Rolm Systems Division, which attempted unsuccessfully to market a second version of its 9751 CBX overseas. The Meridian 1's switch software can be programmed for use in 70 countries, the vendor said.

The company last week gave British Telecommunications PLC exclusive distribution rights for the Meridian 1 in the U.K. British Telecom had announced plans a week earlier to sell its 51% stake in Mitel Corp. ("Industry Briefs," *NW*, Jan. 29).

Users give COS high marks

continued from page 2

nize international standards efforts," he said.

Users acknowledged, however, that COS had unrealistic expectations from the start.

"I don't think there is any doubt about the frustration we've felt about the pace of OSI product availability," Pardo said. "COS has met its goals. But that just goes to show you how difficult it really is to come into the standards process and try to speed things up."

Righting wrongs

COS has had its ups and downs since the group was formed nearly four years ago.

Last year, COS ran into financial problems that led to staff cutbacks and other changes. The problems stemmed from slow sales of its conformance test products and services and from tepid vendor interest in the COS Mark program.

COS has also been criticized for having too few user members.

"In many ways, COS is ahead of its time," said Frank Dzubeck, president and chief executive officer of Communications Network Architects, Inc., a Washington, D.C.-based consulting firm. "Users in the U.S. already have network solutions and aren't in as much of a hurry for OSI as their peers overseas."

But the ITRC arrangement — as well as partnerships signed last year with the OSI/Network Management Forum, the National Institute of Standards and Technology (NIST) and COS' European and Japanese counterparts — are expected to improve COS' fortunes, members said.

For users, COS' plan to join forces with ITRC and the MAP/TOP group could be the biggest plus of all. MAP/TOP and COS have common interests and member companies, said John Sheeran, chairman of the ITRC, which will be dismantled.

"ITRC and COS each have only a finite number of qualified staff to work on [such things as] the task forces and committees, which are required to move these open standards forward," Sheeran said. "The more we can consolidate these work efforts, the more quickly interoperable products will be available."

Lincoln Faurer, COS president and CEO, said the MAP/TOP group will probably wind up as a COS committee and be represented on the COS executive board. He added that the consolidation will provide "a single focal point for OSI and ISDN technological development and advocacy" in North America.

In partnership with its international counterparts, the Promoting Conference for OSI (POSI) in Japan and the Standards Promotion and Application Group (SPAG) in Europe, COS is working to harmonize worldwide OSI and ISDN product availability efforts, Faurer said. The COS-POSI-SPAG Forum formed last year by the three standards groups will provide common specifications for conformance testing systems, he said.

OSI's promise lies in developing and achieving "essentially one flavor of it around the world," Faurer said.

"The only way to achieve enterprise networks at large corporations is to harmonize standards on a global basis," agreed Hughes Aircraft's Huber. "COS has made a commitment here."

Sales of COS conformance tests and interest in its COS Mark program — just three products have received the COS Mark since April 1989 — are expected to pick up later this year as a result of the inauguration of the Government OSI Profile (GOSIP), users said.

GOSIP is a set of OSI specifications that vendors must support in products sold to the government.

COS last year signed an agreement with NIST to help it establish a testing program to ensure that networking products purchased by federal agencies comply with GOSIP.

"GOSIP will give OSI a boost," Huber said. "That should get commercial users interested in OSI since vendors that want to make sales to the government will have to start conforming to the standards."

FAXNeT is a service designed to help readers of *Network World* gather important information via FAX on products and services advertised in *Network World*.

How to Use FAXNeT

Listed below in the FAXNeT Directory are the FAX numbers of participating advertisers in this week's issue of *Network World* and the page number where the ad appears. To use FAXNeT cut out the FAXNeT form and make a copy of the form for each inquiry you want to make. Then just FAX it to the vendor's number listed in the FAXNeT Directory.

Benefits to the *Network World* Reader

FAXNeT is designed to get you product and service information FAST. And, if your request is urgent and requires an immediate response from the vendor just check the "Urgent" Box.

NETWORK WORLD

FAXNeT

Attention: Marketing Communications Manager

Subject: This inquiry was generated by a *Network World* reader who is responding via FAX to your advertisement in *Network World*.

Name _____ Title _____

Company/Div _____

Address _____

City _____ State _____ Zip _____

Phone _____ FAX _____

☐ URGENT

Action Requested
- ☐ Request for Sales Call
- ☐ Request for Proposal
- ☐ Request for Information

Purchase Timeframe
- ☐ Within 60 Days
- ☐ Within Six Months
- ☐ Within One Year

Scope of Purchase Responsibility
- ☐ Enterprise Wide
- ☐ Departmental

Purchase Influence/Number of Sites
- ☐ One Site
- ☐ 2-9 Sites
- ☐ 10-20 Sites
- ☐ 21+ Sites

Product Advertised: _____

_____

Intended Application: _____

_____

_____

Users rethink net facilities mix

continued from page 1

Services Digital Networks, the introduction of virtual data networks later this year and, within the decade, the advent of high-speed switched data services that provide 1.544M, 45M and even 155M bit/sec capacity on demand (see "SMDS pushes users to public nets," this page).

While private nets are still very much alive — the number of T-1 lines installed each year is growing at about 30% — the movement toward switched services is being fueled by simple economics and the improved quality and performance of the public switched networks.

The economies are provided by virtual networks and simple market competition, which has given rise to custom contracts such as AT&T offers in its Tariffs 12, 15 and 16, and off-tariff network deals.

In terms of quality, users are increasingly confident that switched services can provide the same level of performance as private lines because of the enormous investments carriers have made to digitize their nets. End-to-end digital networks provide 56K bit/sec worth of data carrying capacity for every switched call, and virtual networks now offer users line configuration and net monitoring capabilities.

"The advent of all-digital networks means there's little difference between switched and dedicated facilities," said Daniel Briere, president of TeleChoice, Inc., a consulting firm in Manchester, Conn. "It's just a matter of time before users migrate more of their private-line traffic to switched services."

Dynamite prices

For Chevron Information Technology Co., simple economics is the reason it's shifting an increasing amount of its communications traffic to switched services.

The company is currently evaluating bids from vendors to provide a custom network — based primarily on switched services — that will save Chevron about $150 million over five years, according to Tom Mulgrew, Chevron's manager of network design and services in San Ramon, Calif.

Chevron currently supports about 25% of its voice traffic on virtual network services offered by AT&T and MCI Communications Corp., while the rest is supported by leased lines in an electronic tandem network.

The percentage of switched traffic will climb to 75% after Chevron awards the Tariff 12-like contract next month, Mulgrew said.

"Virtual networks for voice have won out because the prices are just dynamite," Mulgrew said.

Similarly, Rockwell International Corp. is currently evaluating bids from several vendors to provide virtual voice services for the firm's widely scattered operating units.

Robert Bystedt, Rockwell's director of telecommunications services in Seal Beach, Calif., said virtual network services currently account for about 20% of the company's voice traffic. That percentage could jump to as high as 70% when Rockwell signs the contract in the next few months, he said.

Bystedt admitted that virtual networks do not provide the advanced networking capabilities of private nets, but he added, "It's pretty difficult today to justify a pure private voice network."

Cost optimization

Many companies find it cost-effective to use dedicated lines between major hubs with heavy traffic volumes and switched services to connect smaller or remote locations. But that equation might change as prices fluctuate.

"What's economical today may not be economical tomorrow," said Len Evenchik, director of communications for the Commonwealth of Massachusetts. "New tariffs are constantly changing our mix of public and private services."

Sears Technology Services, Inc., for example, moved all of its voice traffic from its private network to US Sprint Communications Co.'s switched network last year ("The competitive edge," *NW,* Dec. 18, 1989).

According to company officials, the price of switched voice services from long-distance carriers had declined to the point where it became less expensive to let US Sprint carry the traffic than to keep it on the backbone.

While officials wouldn't disclose details of the multiyear, multimillion-dollar deal, they estimated that it gives Sears one of the lowest per-minute service costs in the country.

Greater confidence

Besides costs, users are willing to migrate more traffic to switched services because of the improved quality, according to Charles Snell, director of computing and communications services at Harris Corp., a semiconductor and electronics manufacturer in Melbourne, Fla.

"We are pretty confident that carriers can provide the same quality and service that we can," Snell said. "Besides, letting the carriers handle our voice traffic has freed us to do many projects we never had time for in the past."

Harris transferred all its voice traffic from a private-voice satellite and microwave network to MCI's Vnet virtual network service last summer.

The company will also consider migrating much of its data traffic to switched services as soon as carriers support frame relay switching, Snell said.

Control counts

Although the use of switched services may be on the rise, users and consultants point out that private networks still provide users with better tools to monitor performance and reconfigure the network on short notice. For many companies, the decision to use private lines boils down to a matter of control.

"I've seen many users decide to pay more for a private network simply because they want full control of it," said Jeffrey Held, a partner in Ernst & Young's Network Strategies consulting practice in Fairfax, Va.

But that may change as carriers roll out new network management tools that give users the same degree of control over public services as they get with a dedicated network management system, Held said.

According to Briere, several of the interexchange carriers already offer limited network management capabilities for their virtual network service offerings, and most plan to expand these capabilities in the near future.

SMDS pushes users to public nets

The introduction of high-capacity, switched broadband data services over the course of this decade may encourage users to migrate data traffic off their private networks and into the public network domain.

The first of these services, Switched Multimegabit Data Service (SMDS), will give users a switched alternative to dedicated T-1 and T-3 facilities.

Local carriers around the country are planning to begin testing SMDS services next year, and some officials predict the technology will be available nationwide within three years ("Nynex service lets users link sites at T-1, T-3 speeds," *NW,* Jan. 8).

Following SMDS will be broadband Integrated Services Digital Networks, which will support integrated switched voice, data and video at speeds up to 155.52M bit/sec ("Meganets," *NW,* Jan. 22).

BellSouth Corp. plans to begin testing broadband ISDN in 1993, according to Larry Bryant, a research manager with the carrier.

Bell Communications Research, a research consortium, predicts that a minimum of two million broadband ISDN lines will be in service by the end of the decade and that the technology will be deployed throughout the country by the year 2025, according to Paul Shumate, division manager of distribution network technology research.

"I could definitely see the mix of traffic in hybrid networks moving more toward the switched side — if the price is right and the services prove to be reliable," said Gus Bender, second vice-president of telecommunications at Travelers Insurance Co. in Hartford, Conn.

Premiere option

Despite the fact that several switched data services are now available, SMDS and broadband ISDN will change the nature of the market over the course of the 1990s because they will support speeds far higher than those available today.

"When you start talking about switched service in the 45M and 155M bit/sec range, the possibilities get pretty exciting," Bryant said.

BellSouth has customers such as hospitals that require "as much bandwidth as we can give them," Bryant said. The services would enable users to establish dial-up links to exchange things such as X rays and high-resolution graphics.

Robert Dettra, manager of strategic planning at AT&T, said that SMDS will cause a proliferation of high-resolution imaging applications. "If you're sending images occasionally between locations — which is the norm — it's pretty hard to cost-justify a T-3," he said.

SMDS networks will eventually be linked to broadband ISDN nets.

Bryant said most carriers envision routing traffic from SMDS switches to so-called regional superswitches, which will multiplex SMDS traffic with standard central office switch traffic and route it over broadband carrier links using Synchronous Optical Network technology as a transport mechanism.

— Barton Crockett

Software bugs delaying LAN Mgr.

continued from page 4

quality and, therefore, is not concerned that the delivery has been pushed back two months from its initial January ship date.

"Like all good projects, [the delivery date] slipped a bit. We're targeting first quarter availability to our OEMs," Murray said. "There's nothing alarming or surprising about the fact that we have bugs in the beta code. We expected the OEMs to find bugs when they ran different tests and configured LAN Manager 2.0 with their own hardware; that's a healthy sign."

According to Murray, the beta-test version of Version 2.0 is already a "more solid product than Version 1.0, [which is currently shipping]."

But several OEMs with beta-test copies disagreed. Speaking anonymously, they reported experiencing disturbing problems beyond what they would usually expect to find in beta test.

"I'm bothered by the fact that the base functionality isn't behaving the way it should," said one OEM engineer. "In over a month of testing, we've experienced memory management and protocol problems. We tried for two days to use the high-performance file system [HPFS], which is supposed to give us a fivefold increase in disk access time. Instead of speeding disk access time, LAN Manager 2.0 trashed the files and we ended up having to reformat the disk."

Another OEM engineer testing Version 2.0 experienced problems with JetBEUI, Microsoft's version of IBM's Network Basic I/O System Extended User Interface network transport protocol, which controls communications between systems on the network.

"The JetBEUI isn't working correctly. It continually drops connections and just goes dead after about six hours," the engineer said. "It's not normal for beta-test copies of network operating systems to drop connections and truncate files, but that's been our experience so far with LAN Manager 2.0."

Another OEM reported that he logged more than 40 network errors in less than one day of testing Version 2.0 last week and complained that he couldn't get the electronic mail compiler to work with the net operating system.

Microsoft's Murray declined to comment on specific bugs in the beta code and downplayed their significance. "We want the OEMs to find these bugs; we're raising the quality level. Whatever bugs the OEMs find get fed back into our data base here; we either replicate the situation or talk to the OEMs to implement the necessary fix."

Jay Misra, product line manager for systems software at 3Com Corp., which codevelops LAN Manager with Microsoft, acknowledged the problems with the JetBEUI protocol and HPFS in the beta test. But Misra said that overall, Version 2.0 passed 3Com's quality checks.

"The beta-test version we got in early January was OK," Misra said. "When we tested the LAN Manager 2.0 shell with our NETBIOS Protocol Stack [NBP], it worked well. And the NBP tests gave us a good indication of how LAN Manager 2.0 was performing."

Misra said the problems 3Com encountered were not unexpected. "We experienced bugs in the JetBEUI protocol and HPFS, but that's not unusual. We applaud Microsoft's decision to delay shipment until all the bugs are out of it," Misra added.

Bob Nussbaum, Digital Equipment Corp.'s strategic marketing manager for PC Integration products, said his company hasn't yet received beta-test copies of Version 2.0.

"Clearly, we're unhappy with the delay in shipping us the final code. But our relationship with Microsoft has been a positive one, and we expect they'll overcome the problems," Nussbaum said.

Despite their less than auspicious first-run beta tests, most of the OEMs took a pragmatic view of the problems with Version 2.0.

"These problems will shake out," one OEM said. "It's just that Microsoft should have solved them months ago."

Another OEM commented, "What choice do we have? We've licensed it, and now we have to wait for it to work."

Bill would let users block ANI

continued from page 2

customer to see the originating telephone number on a screen before answering a call, has touched off a bitter public battle between people who say their privacy rights are being violated and others who view the new technology as a tool to help them screen out threatening or harassing calls.

One particularly controversial ANI-related practice involves corporations that collect phone numbers in a data base, cross-reference them to addresses and other demographic information and sell the lists for telemarketing purposes.

Corporate users are caught in the middle of the debate, saying they understand privacy concerns but want to be able to develop new business applications based on the forwarding of callers' numbers.

For example, companies are currently developing applications that will let them instantly look up customers' files based on their phone numbers or capture callers' numbers when lines are busy and automatically redial, rather than putting them on hold.

Keenen Peck, an aide to Kohl, said that, as drafted, the bill addresses blocking only for the instantaneous delivery of phone numbers. The lawmaker will explore other issues such as whether carriers should be allowed to continue delivering reports of numbers that dialed into an 800 service.

Policymakers have to decide whether "it makes sense from a policy point of view to let people block the instantaneous transmission of their phone number when the recipient is eventually going to find out their phone number and address [from a monthly carrier report] anyway," Peck said.

If a carrier refuses to provide blocking, customers could seek relief under federal wiretap laws. The laws provide a minimum award of $1,000, but damages could be higher, depending on a customer's specific claims.

Corporate users are in the middle of the debate, saying they understand privacy concerns but want to develop new business applications.

▲▲▲

The bill does not specify whether carriers would be allowed to charge for blocking or whether users would be able to block on a call-by-call basis or have blocking for all calls.

Observers were split in their reactions to the bill.

"It defends the rights of obscene callers," said Ian Angus, president of Angus TeleManagement Group, Inc., a telecommunications consultancy in Toronto. Angus said the bill could cause corporations to reexamine developing applications based on ANI. He added that he is skeptical the bill will pass.

James Kendrick, chairman of the ISDN Users Workshop, which is working to develop applications based on ANI, said any negative impact from Kohl's bill will be short-lived.

Even without blocking, corporations don't expect to be able to identify 100% of incoming calls, he said.

Corporations might also inform customers that if they block the transmission of their numbers, companies could refuse their calls. This might be particularly true for 800 calls, on which the corporation must pay the charges, he said.

Claude Stone, vice-president of the First National Bank of Chicago, which is reviewing ways to provide better services to its customers and trading partners with new network technologies, agreed that passage of the bill wouldn't mean the end of the world.

According to Stone, the impact will be much less if users can block their calls on a case-by-case basis than if all calls are blocked.

"If someone chooses to block, then you may not be able to offer that person services you offer other customers," he said.

If those services truly have value, most customers will be willing to transmit their phone numbers to take advantage of them, he said.

"In the long run, I think the number of individuals that would block is not going to be significant enough to impact the full market potential of those kinds of applications."

ANI users face challenge

continued from page 1

ming host DBMSs so that a telephone number delivered from a private branch exchange serves as a "primary key" for requesting a customer profile. DBMSs typically use names, account numbers or social security numbers as primary keys.

That task, though relatively straightforward, absorbed about half the time that two early users — Union Pacific Technologies and AT&T American Transtech — devoted to developing their ANI applications.

At Union Pacific Technologies, a subsidiary of Union-Pacific Corp., ANI applications required between six and eight man-months of development work.

About two man-months were spent working on connectivity software that enables the company's Rockwell Telecommunications, Inc. PBX to transfer an incoming number to the company's IBM mainframe, according to Phil Seifert, assistant vice-president of commercial systems and services at Union Pacific Technologies in St. Louis.

A key to establishing that PBX-to-mainframe link was proper timing — ensuring that the PBX passes a call to an agent at the same time the DBMS passes customer information to that agent's screen.

Union Pacific uses ANI to display a caller's most recent transactions, to store for callback the numbers of customers who call in and hang up, and to distinguish individual callers and extensions within a customer firm.

At American Transtech, an ANI application the company plans to pilot-test uses number identification as a front end to a financial inquiry system. This is the first ANI application developed specifically for the company's IBM IMS DBMS running on an Amdahl Corp. mainframe.

The front end, which the company refers to as an ISDN driver, takes the incoming telephone number and correlates it to an account number, which previously was used as a primary key, according to Terry Morello, director of information systems application development for Jacksonville, Fla.-based American Transtech.

Development of that software, which acts as an interface between the company's AT&T System 85 PBX and its mainframe, took less than one man-year, with three months of coding involved, according to Hassan Pirasteh, a technical manager in information systems support.

"This was a heavy analysis project, not a heavy implementation project," Morello said, explaining that, like Union Pacific, much of American Transtech's software work involved developing the interface between the mainframe and the PBX, including synchronizing several components so that the telephone call arrived at the same time as the screen of related information.

Despite the well-documented benefits of ANI and the positive experiences of these early users, some question whether users can achieve the full promise of ANI without major reprogramming.

Users won't enjoy all the advantages of ANI until they restructure data bases so that a customer profile triggers the display of other data tailored to that customer, said Lise Stanford, vice-president for telecommunications at First Tennessee National Association in Memphis.

"This would allow users to say, 'I see that you use all these products. Do you know that we have this certain product?' " Stanford explained. The barrier to this capability, Stanford said, is developing software that can analyze the data in a customer profile and gather related information — some of which may be unique to particular applications and stored in different locations.

Shaku Atre, partner at Atre Computer Assistance, a division of Coopers & Lybrand in Rye, N.Y., said current DBMSs lack the intelligence needed to correlate product or service information to data in a customer profile.

Atre said users would need rule-based inference-drawing systems that would make decisions on which information to retrieve.

Novell rallies suppliers

continued from page 8

ket until well into the second half of the year, XDB Systems said it is already beta-testing an NLM version of its XDB-Server. The NLM will support all of XDB Systems' DOS client tools and can be used along with those tools to develop data base applications compatible with IBM's DB2.

Automated Design Systems was at the Novell conference demonstrating its Windows Workstation products, which add network utilities to Microsoft Corp.'s increasingly popular Microsoft Windows environment. One of the products, Windows Workstation Print Manager, is already available as an NLM.

Share Communications, Inc. was sneak-previewing a facsimile gateway NLM that it plans to release at next week's Networld '90 show in Boston. Called FaxShare 386/NLM, the product is currently going through Novell's certification process.

Using Brooktrout Technology, Inc.'s direct inward dialing (DID)-based Multi-Channel fax board, the product provides up to 32 independent channels that can be programmed to transmit or receive faxes. The DID capability lets each local-area network user have a personal fax number while sharing a single telephone line.

Coming Soon, A Vision Of The Future Of Computing That Begins With A Bridge To The Past.

NCR